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THE AMERICAN JOURNAL OF OTOTOLOGY.

A QUARTERLY JOURNAL

OF

Physiological Acoustics and Aural Surgery.

EDITED BY

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THE AMERICAN JOURNAL OF OTOLOGY.

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Original Communications.

COMPARATIVE MORPHOLOGY OF THE EAR.

THIRD ARTICLE.

BY CHARLES SEDGWICK MINOT,

BOSTON, MASS.

WE have next to pass in review several series of organs, which are by no means homologous with one another, although the common function of audition has been assigned to them all. We shall speak, *first*, of the paired otocysts of worms, which are to be regarded as homologous with those of molluscs; *second*, of the unpaired otocyst of the *Turbellaria* and *Tunicata*; *third*, of the auditory hairs of crustacea; *fourth*, of the tympanal organs of the Orthoptera.¹ This will end what we shall have to say of the invertebrates.

What relation, if any, the unpaired otocysts may have to the paired it is impossible to decide at present. The former may be the product of the fusion of the latter, or they may have arisen independently. Nor is there any reason for associating the otocyst of *Turbellaria* with that of *Tunicata*, except that both are single, and placed in the median line so as to connect directly with the brain.

5. PAIRED OTOCYSTS OF WORMS.

The earliest discovery of paired auditory vesicles in worms, with which I am acquainted, is due to Stannius (IX., 379), who described in *Arenicola piscatorum* two *Knöpfen* containing crystals, and placed at

¹ This is necessarily deferred until the next article.

the sides of the œsophageal ring. Shortly after Stannius' publication Siebold (VIII.) pointed out the analogy of these "Knöpfen" with the otocysts of molluscs. Similar observations were afterwards made on other *Annellida* by Quatrefages,¹ who also added to his observations in 1850 (VII.), and again in 1870 (VI.). Besides these we have to mention the incidental references by Claparède (I.) and Leydig's brief notices (III. et al.).²

Among Nemertines they were discovered by Gräffe, and subse-

¹ QUATREFAGES: Compt. Rendus Acad. Paris., XIX. (1844), p. 195. See also Ann. Sci. Nat., II. (1844), p. 94.

² The following are the principal articles to be consulted:—

- I. CLAPARÈDE, EDOUARD: Glanures zootomiques parmi les Annélides de Portvendres (Pyrénées orientales) (Otocystes, pp. 495 and 500).
Mém. Soc. Phys. Genève, XVII. (1864), 463–600. 8 Pls.
- II. KEFERSTEIN, WILHELM: Untersuchungen ueber niedere See-thiere (Nemertinen, p. 51, — Otolithenblasen derselben, p. 85).
Zeit. wiss. Zool., XII. (1862), pp. 1–48. Taf. I.–XI.
- III. LEYDIG, FRANZ: Anatomische Bemerkungen ueber Carinaria, Firola und Amphicora. (Gehörorgan von Amphicora, pp. 329–330.)
Zeitschr. wiss. Zool., III. (1851), 325–332.
- IV. MARION, A. F.: Recherches Zoologiques et Anatomiques sur des Nématoides non Parasites, Marins. (Organes de l'Audition, p. 68–69.)
Ann. Sci. Nat. Zool., XII. (1870), Art. 14, pp. 100. Pl. XVI.–XXVI. (A–K of text).
- V. MECZNIKOW, ELIAS: Beiträge zur Kenntniss der Chaetopoden. (Gehörorgan bei Fabricia, pp. 331–332.)
Zeit. wiss. Zool., XV. (1865), pp. 328–341. Taf. XXIV.–XXV.
- VI. QUATREFAGES, A. DE: Note sur l'Organe Auditif de la Marphyse Sanguine.
Ann. Sci. Nat. Zool., XI. (1870), 345–346.
- VII. — — — Études sur les Types Inférieurs de l'Embranchement des Annelés.
Mémoire sur les Organes des Sens des Annélides. (Sens de l'Ouïe, p. 28.)
Ann. Sci. Nat. Zool., XIII. (1850), 25–41. Pl. II., figs. 16–19.
- VIII. SIEBOLD, C. Th. von: Ueber das Gehörorgan der Mollusken. (Zusatz ueber Gehörorgan der Arenicola, p. 166.)
Wiegmann's Arch., Bd. I. (1841), 148–168.
- IX. STANNIUS, HERMANN: Bemerkungen zur Anatomie und Physiologie der Arenicola piscatorum.
Müller, Arch., 1840, pp. 352–380. Taf. XI., fig. 1–15.
(S. 379 describes two *Knöpfen* containing crystals at the sides of the œsophageal ring-otocysts.)

Other papers might have been enumerated also, but there appeared to be little object in lengthening the list.

quently studied by Keferstein (II.) and Claparède.¹ In Nematods they have been observed to my knowledge only by Marion (IV.).

The entire series of observations is so fragmentary that we know nothing accurate concerning the minute structure of the organs under consideration, nor are we able to say how general their occurrence may be, nor yet whether, when they do occur, they are all closely similar or not. They present, however, an evident general likeness both with one another and with the otocysts of molluscs. Among *Vermes* they have as yet been found only in a few isolated Genera, for example, among Annelids only in a few genera of *Polychæta*. They may lie at the sides of the œsophagus (*Arenicola*, *Amphicorine*), or in the second segment more upon the dorsal side (*Amphiglæna*, *Fabricia*); as regards the supposed otocysts of *Fabricia*, Metschnikow thinks they open exteriorly and doubts their being auditory vessels. Of the development of the otocysts nothing is known. When we consider that the ventral ganglionic cord of worms is, probably, homologous with the pedal ganglion of molluscs, it is at once evident that the relative positions of the otocysts are quite similar. Further, the minute anatomy is, as far as known, essentially the same in both subkingdoms. I think we must therefore conclude that the otocysts in these two great divisions are strictly homologous, and in a subsequent article it will, I think, be sufficiently demonstrated that this homology must be extended to include the vertebrates also.

Among the worms the otocystic walls are undoubtedly composed of a lining epithelium, which rests upon a fibrous *tunica propria*. They contain otoliths, usually several small ones (Nematods, Nemerteans, *Arenicola*, etc.), or rarely a single large one (*Amphicorine*). The otoliths tremble constantly. The nerve comes up to one side, but its origin is not satisfactorily determined; although it probably springs from the supra-œsophageal ganglion.

As Leydig's description of the otocysts of *Amphicora* is the best I have found of these vesicles in any worm, I quote it in full. It forcibly illustrates our imperfect knowledge, —

“Betrachtet man sich aber den unteren Gehirnknoten, so sieht man

¹ Beobachtungen ueber Anatomie und Entwicklungsgeschichte an der Küste Normandie angestellt.

ein Gehörorgan so schön und klar, wie bei Gasteropoden und auch von ganz gleichem Charakter. Schon ohne dass der Wurm mit einem Deckglas beschwert ist, wird es erkannt. Es zeigt sich als zwei Blasen, die 0.0135''' gross sind und seitlich dem Gehirnknoten unmittelbar aufsitzen. In der Blase liegen gegen 20 Otolithen, welche dieselbe zitternde Bewegung ausführen, welche von den Gehörsteinen der Gasteropoden bekannt ist. Nur bezüglich der Otolithen lag darin ein kleiner Unterschied vom Gehörorgan der Gasteropoden vor, dass sie nicht jene genane spindelförmige Gestalt hatten, sondern von mehr rundlicher oder auch unregelmässiger Form waren."

6. MEDIAN OTOCYST OF TURBELLARIA¹ AND TUNICATA.

As regards the otocysts of the *Turbellaria* it is to be expected that we shall ultimately be able to homologize them with the paired otocysts of molluscs and annelids. It is well known that in many crustacea the two eyes meet in the median line and fuse into a single organ. This fact suggests the possibility that in the *Turbellaria* the single otocyst may have arisen by the fusion of two vesicles; but this is merely a guess, since we know absolutely nothing of the development of the organ. The plausibility of this view is strengthened by the fact that one of the Rhabdocœla, *Sidonia elegans*, has two otocysts (Max Schultze).

The otocyst itself is a single round vesicle, placed directly over the brain. It has not been found in all forms, and on the other hand there are two smaller supplementary otocysts in a few species (Graaf). Concerning the histology of the vesicles nothing is really known.

¹ The term *Turbellaria* is here used in the restricted sense, i. e., referring only to the Planarians (*Rhabdocœla* and *Dendrocœla*), or those members of the class of Plathelminths for which I have proposed the name of *Pharyngocœla* in an article on these animals, which was published in the third volume of Semper's *Arbeiten*. Of course, as the term is here used, the Nemertean worms are not included, and in fact it would be unscientific to do so.

The following are the principal authorities:—

JENSEN, OLAF S.: *Turbellarien ved Norges Vestkyst*. (Pris-skrift.) Bergen, 1878, 4to. (Høreorgan, p. 15.)

SCHULTZE, MAX SIGMUND: *Beiträge zur Naturgeschichte der Turbellarien*. 4to. Greiswald, 1851. (Gehörorgan, pp. 25–26.)

GRAAF, LUDWIG: *Zur Kenntniss der Turbellarien*. *Zeit. wiss. Zool.*, XXIV., 123–160. Taf. XIV.–XIX. (Gehörorgan, p. 138.)

The otoliths have been somewhat more studied. There is usually a single round stone, but in some species of *Monocelis* there are two small outgrowths from the main stone, while in *Aphanostomum* there are four such. These additional parts are described as separate stones united with the main large one. If a round otolith is crushed it shows a tendency to cleave into a central part and outer zone (Jensen). The central portion exhibits a cross-shaped figure sometimes very distinctly.

Passing to the otocysts of *Tunicates*, we find the data as unsatisfactory as in the case of the low worms we have just reviewed. Our knowledge is based principally upon the observations of Kowalewski, Kupffer, Fol, and Ussow.¹ The researches of the last mentioned author appear to be particularly important, so that it is a matter of regret that they are published in Russian, which language I am unable to read.

In the tailed Ascidiæ (*Appendiculariæ*) there is a single otocyst of which Fol gives the following description: "Sur le côté gauche du Ganglion est située la vesicule auditive, presque sphérique, et renfermant une concrétion également sphérique. J'ai aperçu quelquefois de fines soies isolées les unes des autres et qui suspendaient l'otolithe à la paroi de la vésicule." Kupffer has described the epithelial cells and stiff hairs of the wall. In other forms there are two otocysts symmetrically placed (*Doliolum*, etc.), but concerning the development and homologies of these paired organs, I have found nothing—although Ussow may have something about it. In the

¹ KOWALEWSKI: Entwicklungsgeschichte der einfachen Ascidiæ. Mém. Acad. St. Petersb., X. No. 15 (1866), pp. 19. Taf. I.-III.

——— Weitere Studien über die Entwicklung der einfachen Ascidiæ. Arch. f. m. Anat., VII. (1871.)

KUPFFER, E.: Die Stammverwandschaft zwischen Ascidiæ und Wirbelthieren. Arch. f. mikros. Anat., VI. (1870.)

——— Zur Entwicklung, der einfachen Ascidiæ. Arch. f. mikros. Anat., VIII. (1872.)

FOL, H.: Études sur les Appendiculaires du Détroit de Messine. Mem. Soc. Phys. d'Hist. Nat. Genève, 1872.

USSOW, M. M.: Beiträge zur Kenntniss der Organisation der Tunicaten. Nachrichten Moskau Univ., XVIII. Hft. 2, (1876), pp. 62, 9 Taf. (In Russian, quoted here from Hoyer.)

simple Ascidians, the auditory organ is developed from the lower floor of the cerebral vesicle. As Balfour, in his "Comparative Embryology," vol. ii., p. 437, gives a very clear description of the development and structure of the organ, I quote his account, which is based upon the researches of Kowalewski and Kupffer. Balfour commits the error of making his statements apply to all the tunicates, whereas in fact they apply only to the simple Ascidians. The auditory organ "consists of two parts, (1) a prominence of the cells of the floor of the brain, forming a crista acustica, and (2) an otolith projecting into the cavity of the brain, and attached to the crista by delicate hairs. The crista acustica is formed of very delicate cylindrical cells, and in its most projecting part is placed a vesicle with clear contents. The otolith is an oval body with its dorsal half pigmented and its ventral half clear and highly refractive. It is balanced on the highest point of the crista. The crista acustica would seem to be developed from the lower part of the front vesicle of the brain. The otolith, however, is developed from a single cell on the dorsal and right side of the brain. This cell commences to project into the cavity of the brain, and its free end becomes pigmented. It gradually grows inwards till it forms a spherical prominence in the cavity of the brain, to the wall of which it is attached by a stalk. At the same time it travels round the right side of the vesicle of the brain (in a way not fully explained) till it reaches the summit of the crista, which has become in the mean time established." The development presents a close and striking analogy in the simple Ascidians with that of the ear. The crista and otolith are derived from the cerebral vesicle. In no other animals are the auditory organs known to have a similar origin.

7. AUDITORY HAIRS OF CRUSTACEA.

The *Crustacea* have, as far as at present known, no organs homologous with the otocysts of other invertebrates. But their skin bears peculiar hairs, that are evidently sensory in function, since they are connected with nerve filaments. One form of these hairs, found hitherto only in the higher forms of the class, have been assigned the office of audition, although absolute proof thereof is, I think, still to

be given. In order to give a clear account of these structures, we prelude a brief description of the skin and hairs in general, the hairs having *no* resemblance to those of vertebrates.

The epidermis, or true ectodermal skin, of arthropods, is a single layer of cells — a cylindrical epithelium. Upon this rests the thick crust or cuticula, which, as is well known, is composed mainly of chitine, and is secreted by the action of the underlying epithelium. From place to place the cuticula is pierced by very small vertical openings; the so-called pore-canals. These do not, however, open upon the exterior, but are covered over by a projecting hollow process of the cuticula, making a minute tapering hair (Fig. 14). The cavity of the chitinous hair-tube is filled by a protoplasmatic process, which comes up through the pore-canal, and arises upon a cell-body lying right under the pore-canal. The hair cells are of larger size than the unmodified cells of the epidermis, and contain usually several large and conspicuous nuclei. It is possible that each hair-cell is in reality a cluster of cells, as some authors have maintained; but it is more probable that we have to do exclusively with unicellular structures. The hairs are tapering, of various sizes and forms. They are generally, if not always, constricted around the base, and are connected by a thin cuticular membrane with the outer edges of the pore-canal. Hence we have a stiff hair movable from its base acting as an articulation. The hairs are in many instances provided with secondary lateral branches, thus imparting to these simple structures a likeness to feathers.

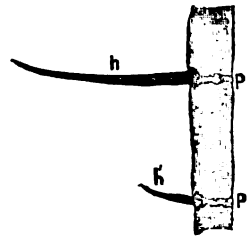


FIG. 14. Grasshopper, *Ca-
loptenus*. Section of cuticula.
p, pore-canal; h, h', hairs.

The chitinous hairs play an important part in the physiology of Arthropods. We find them assuming olfactory functions in the antennæ, and undergoing corresponding structural modifications. Indeed, such olfactory cells have several times been mistaken for auditory organs by entomologists, an error which has only recently been set aside. Compare the closing paragraph of this article.

In the Crustacea, certain of the hairs are thought to perform the function of audition; but this, as before stated, requires further and

more rigorous demonstration. The supposed auditory hairs present marked structural peculiarities, and occur either isolated or clustered at special points, namely, the base of the inner antenna in the higher Decapods, and in the inner swimmeret of the tail in Schizopods (*Mysis*). The clusters are invaginated so as to form either open pits or closed vesicles, which may be fairly termed otocysts, and may contain special bodies — otoliths.

We shall, therefore, pursue the following order of treatment : First, the general character of the auditory hairs ; second, their distribution ; third, the peculiarities of the invaginated clusters, including the shape of the invaginations ; and fourth, the otoliths ; finally, a few words will have to be added concerning the nerves.

Auditory hairs have hitherto been described only in the higher crustacea (*Podophthalmata*) and *Hyperida*, a family of Isopods. As regards the *Hyperida*, I repeat merely the statement found in Claus' "Zoologie" and Gegenbaur's "Comparative Anatomy." I have not been able to go through the original papers properly. As yet I have found only a doubtful description by Kröyer, which Hensen was unable to confirm. Claus, in his "Grundzüge" (3d edition, p. 517), in giving the characters of the Hyperina, "Ein paariges Gehörbläschen ueber dem Gehirn (*Oxycephalus*, *Rhabdosoma*)."¹ It is possible that similar hairs will be found in the lower forms also, whenever investigation shall turn to the solution of that question. There are many Phyllopods which bear upon their antennæ a number of hairs, exhibiting marked specializations and in some cases known to receive a nerve filament. In these animals the functions of such hairs have been currently assumed to be either olfactory or tactile, although such interpretations rest upon a basis purely subjective. When actual observation shall have decided what purpose is subserved by these often described appendages it will perhaps be found that they are auditory in function.

On the other hand, certain hairs of Isopods have without sufficient foundation been considered auditory in function. Leydig¹ described in 1860 some peculiar transparent feathered hairs on the inner an-

¹ LEYDIG, FRANZ : Ueber Geruchs- und Gehör-organe der Krebse und Insekten. Arch. f. Anat. Physiol. 1860.

tennæ of *Asellus aquaticus*; to these hairs Sars¹ and Ritzema Bos assigned afterwards auditory functions. Similar hairs occur on other Isopods. Recently Leydig² expresses himself unfavorably to Sars' interpretation. Rabl-Rückhard in a brief article³ sides with Leydig, on the ground that the hairs swing readily to and fro with the wave motions of the water, and show no tendency, as far as he observed, to make real sound vibrations. He suggests that they may serve to perceive the disturbance produced in the water by an approaching animal. This view possesses considerable plausibility; and certainly we lack positive information concerning the auditory organs of Isopods. The hairs in question (Fig. 15) occur on the antennæ, legs, and tail. They are rather long with a straight, smooth, tapering shaft, slightly enlarged at its base, and bearing at its top a bunch of very fine hairlets spread out fanlike.

Our knowledge of the auditory hairs is due to Farre, Leuckart, and others, but especially to Hensen, whose results, however, sorely demand amplification and to some extent verification. Unfortunately his article is a slovenly composition, and though his observations are valuable he has presented them in so disorderly a manner that it has cost an exasperating amount of labor to get his data into a presentable form.

The auditory hairs of Crustacea are modifications of the indifferent hairs described above. They present the following features in common with one another (Fig. 16).⁴ Above the basal constriction the cuticula of the hair is quite thin and forms a bulb of greater diameter than the remaining shaft, which is also distinguished by having a thicker chitinous envelope. The outer edge of the pore-canal forms a thickened ring from which springs on one

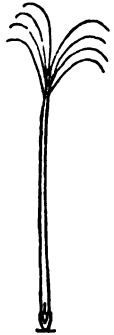


FIG. 16. *Asellus aquaticus* "Büschelhaar," or supposed auditory hair of antenna.

¹ Sars, G. O.: *Histoire naturelle des Crustacés d'Eau douce de Norvège*. (Soies auditifs, *Gammarus*, p. 62, *Asellus*, pp. 95 and 112.) Christiani, 4to, 1868.

² LEYDIG: *Zeit. f. wiss. Zool.*, XXX. (Suppl.), 251.

³ RABL-RÜCKHARD: *Ueber die Hörhaare der Isopoden, besonders des Asellus aquaticus*. *Sitz. ber. Nat.forsch. Freunde, Berlin*, 1878, 148-151.

⁴ Our knowledge is so fragmentary that a general description can only be approximate, and may hereafter need rectification.

side a projecting thickening that enters into the composition of the bulb. Hensen has named this part the "tooth." It might also be described as a local thickening of the one side of the basal enlargement. Opposite to the tooth there is a longitudinal, rib-like thickening of the cuticula of the shaft, called the *lingula*. The lower end of the *lingula* projects into the cavity of the bulb.

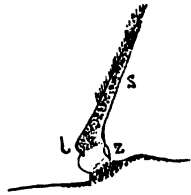


FIG. 16. *Crangon vulgaris*. Auditory hair. z. Hensen's Tooth; l. Lingula.

Concerning the cells (Trichogens) which belong to the auditory hairs, we possess no knowledge. Hensen's description of the hair-making cells obviously refers not to the Trichogens, or true hair cells, but to modified parts of the epidermis.

As regards the distribution of the hairs: The free hairs occur principally in two regions at opposite ends of the body. They have been most fully studied in the *Caridea* (shrimps and prawns) and in *Mysis*. We refer, therefore, principally to these forms. They are placed *first*, on the basal joints of the inner antennæ and also a few on the outer antennæ; *second*, on the tail or last segment. Their number and distribution varies according to the genus and somewhat also according to the species. In an adult *Palæmon antennarius* there are about five hundred, of which about two hundred and fifty belong to the antennæ, the remainder to the lateral tail swimmerets. The number appears to increase somewhat with the age of the individual. There is a marked tendency for the hairs to collect in little groups, or more especially curving rows.

The clusters of hairs found in the invaginations may be regarded as a group of hairs, such as we have just signalized, but distinguished by accompanying accessory modifications. Auditory pits occur at both ends of the body. In the *Decapods* the pit or sack lies in the basal joint of the inner antenna, but in the *Schizopods* is placed in the inner lappet or swimmeret of the caudal fin. In *Thysanopoda* sp? there are three transverse rows of "Hörhaare" on the basal joint of the inner antenna, representing, perhaps, the condition in which the cluster on the joint has been formed but not invaginated.

In the regions of the inturned clusters (otocysts) the cuticula of

the skin, which of course forms the limiting wall of the cavity, is much thinner than on the exposed parts of the body. The pore-canal at the base of the hairs are usually quite wide, and their course through the cuticula is nearly vertical to the surface, although sometimes oblique as is found to be the case in *Palæmon*.

The basal bulb of the hairs is less distinct than in the free hairs of the surface, and in the highest forms, crabs, can be recognized only obscurely. It is said that the *Lingula* and Hensen's "Zahn" can always be detected, but Hensen's figures represent those points imperfectly. The shaft is always tapering, and varies greatly in length, reaching its maximum extension in the crabs (see below). In the simpler forms the hairs are nearly straight or at most only slightly curved; such hairs occur in *Astacus* and *Crangon*. The first specialization met with is the bending of the hairs at a marked angle. This modification is found in *Palæmon*, but, curiously, not in the closely allied genus *Crangon*; again in *Mysis* and *Leucifer*, in both which the bent ends penetrate the body of the otolith.

In the *Brachyura* and several *Macroura* (*Porcellana*, *Gelasimus*, etc.), there is a clear advance of organization in that three distinct kinds of hairs are developed in the antennal vesicle: in the crab there are first, simple curved hairs, lying in one cluster; second, another cluster of short bent hairs; and third, a single row of long hairs with just the tip bent and a short spine-like continuation of the shaft beyond the angle of the bend. Curiously enough only hairs similar to this last kind were observed by Hensen in the crab larva (*Zoëa*).

The feathering of the hairs likewise varies considerably, but we cannot say at present which variety is the primitive nor which are the derived forms. It will be convenient to call the secondary tapering shafts, that arise from the main stem and produce the feathering, *hairlets*. The hairlets are wanting in *Mysis*, but are found on the majority of hairs in the vesicles. They rarely attain a length greater than one fifth of that of the main shaft. They are confined to the

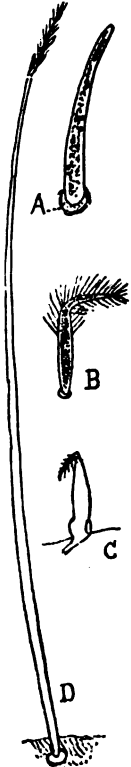


FIG. 17. Crustacea: various forms of auditory hairs. A, B, D, *Carolinus mænas*; C, *Mysis*.

distal end of the shaft and may extend more or less than half way down its length. They may arise either irregularly, or spring from a spiral line (*Astacus*) or become more like the barbs of feathers by growing out along two longitudinal lines on opposite sides of the hairs, or, again, in a double longitudinal row on one side only (*Crangon*).

We take up next the form of the auditory vesicles and the disposition of the hairs in them. We begin with the antennal organs of Decapods and will consider the caudal apparatus of *Mysis* separately. To both structures is common the characteristically thin cuticula.

The antennal otocyst of Decapods is situated on the upper side of the basal joint of the inner antenna. The basal joint is itself often enlarged; in the crabs greatly so (Fig. 18). The relative size of the invagination also varies extensively. In its simplest form the otocyst is a widely open pit (*Palaemon*), the opening being closed by hairs, as may be well seen in *Crangon*. In other forms the opening is reduced to a narrow fissure, which may then be partially closed as in *Palaemon* by an overlying valve-like flap of the integument. When the entrance to the pit is narrowed the opening usually comes to lie towards the inner side and distal end of the joint. A step further and the pit becomes entirely closed over (*e. g.*, *Hippolyte*). In all the Decapods except the crabs (*Brachyura*) the otocyst varies but slightly from the simple rounded form. In the crab larva they still preserve their simple shape; concerning their configuration during the second larval stage, the megalops, I have found no statements; in the adult important modifications supervene in the shut vesicle by the formation of projections and recesses on the medial walls, and of thickened knots and ridges of the cuticula of the lateral walls; these last serve for the attachment of muscles. For the minutiae we must refer the reader to Hensen's somewhat lengthy and confused description. An approach towards the complexity of form in the crabs is found in the prawn *Alpheus*, in which the otocyst is divided into an anterior smaller part, and a posterior larger part containing the otolith. The

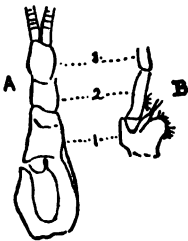


FIG. 18. Inner antennae. A., of lobster; B., of *Palaemon*.

hairs in the two divisions are different, those in the posterior being bent.

As regards the disposition of the hairs in the otocysts there appears to be a general tendency to form curving rows, which may extend to make a complete circle. The rows may be single or double. There may be several concentric rows; sometimes there is a central cluster of hairs. This is, however, by no means the only system of arrangement; thus in *Sergestes Atlanticus* there are two longitudinal rows, and, crossing them, three transverse rows. But it must be added that there exists at present no adequate basis for a general comparative description. Unfortunately Hensen's article is almost innocent of generalizations, being entirely devoted to detail, a striking instance of what Mill has called reasoning from the particular to the particular, — so that the mental labor to utilize his investigations has to be supplied entirely by the reader. In the crabs, as above mentioned, there are three kinds of hairs: the simple curved hairs lie in the outer corner of the sac; the short bent hairs occupy the posterior corner (Hensen's *Otolithen-platz*), which is further characterized by being pierced by large and conspicuous pores, which are supposed to serve as ducts for underlying unicellular glands; the long bent hairs arise along a line extending from below laterally upwards. (Cf. Fig. 18.)

The otocyst of *Mysis* and other Schizopods is an invagination of the upper surface of the inner swimmeret of the tail. It is an oval vesicle (Fig. 19), compressed in its vertical diameter and most flattened on the under side, which receives the nerve, supports the oblate otolith, and bears the circlet of auditory hairs, that encompass the otolith. (Fig. 19.) The opening is a narrow oblique slit, partly covered over by a flap-like growth of the integument, and lies near the outer or lateral edge of the upper surface of the lamella. The organs under consideration are so conspicuous that there are many incidental references to them in the descriptions of species, so that I much regret not to have had at my disposal the time necessary to cull



FIG. 19. *Mysis*. Oto-
cyst in inner swimmeret
of tail. n, nerve; ot,
otolith.

these data from the writings in which they are scattered. The hairs form about two thirds of a circle around the base of the large otolith, making an open bow; near the ends of the bow the hairs are disposed in a single row; but towards its centre in double or treble lines. As before stated, the ends of the hairs are all bent, curving over towards a common centre, the bent tips penetrating little holes in the substance of the otolith, which is otherwise unsupported.

Otoliths are found in the auditory pits or sacks in all species, with the exception of the crabs. They are of two kinds: *first*, foreign bodies, such as grains of sand or small crystals introduced from outside, — such are found in the long-tailed Decapods (*Macroura*) with open otocysts; *second*, a single large (organic?) growth, found in the antennal sacks when closed and in the caudal sacks of Schizopods.



FIG. 20. Sand grains from the antennal ear of the craw-fish.

In the first case the otoliths are a mass of foreign particles, usually grains of sand (Fig. 20), which are introduced anew after each moult; hence, if the animal, a prawn or crawfish for instance, passes through its moult in clean water with no foreign particles there are no otoliths in the vesicle after the moult; again, if instead of sand grains, crystals of uric acid are put in the water, the crystals are found acting as otoliths. The animal probably always introduces them itself. The indigenous otoliths, on the other hand, are each a single mass, supposed by Frey and Leuckart to consist at least in *Mysis* of chitine impregnated with lime salts. Hensen, on the contrary, maintains that they contain no chitine but are built up almost entirely of chalk combined with some acid. Neither view applies to the otolith of *Leucifer*, which cannot be either chitine or chalk, since it is immediately dissolved by caustic alkali and hydrochloric acid. Absolutely nothing is known of the development of the otolith. In the closed otocysts it may be supposed to remain permanently, when once formed. In the Schizopods, on the contrary, it is cast off with every moult, and rapidly reformed in a manner as yet undetermined. As regards the size of the otolith, it may be roughly indicated by fixing its diameter as usually more than half that of the sack. It is always rounded in shape. The only minute description of the structure we

possess refers to *Mysis*. In this genus the otolith is a thick rounded disk, the lower surface flattened, the upper convex with a slight prominence. It has a granular centre ; a strongly marked line, dividing off an outer layer from an inner layer around the granular core ; the outer layer is pierced by fine holes occupied by the bent ends of the auditory hairs ; it shows radial lines, and also concentric lines indicating a laminar structure ; these last mentioned markings are not very distinct nor always parallel with the surface, but bend out and in as if yielding to the entering hairs.

It remains only to describe the connection of the hairs with the nervous system. Here we must rely exclusively upon Hensen, whose account refers to several structures, the morphological nature of which he has probably misinterpreted ; the structures in question are a fine thread, named *chorda* by Hensen, which arises from the *lingula* of the hair, passes down through the pore-canal some distance in a straight course into the underlying tissues ; and second, a sheath enclosing the thread. The lower end of the thread is said to become continuous with a ganglion cell, which in its turn is the termination of a peripheral nerve fibre. That the thread itself is a nerve filament is rendered doubtful by Hensen's assertion that it is sometimes pulled out with the hair, and remains straight and stiff, having none of the frailness and flexibility of nervous tissue ; moreover it resists the action of caustic alkali. As to what the sheath may be Hensen's observations afford not the slightest clue. Further investigations are urgently needed.

The process of moulting the hairs presents various peculiarities, which Hensen describes, but, unfortunately, with so total a disregard of the structure of the skin that his account can only be partially comprehended. We will therefore only mention that the cuticula of the hair is shed, a new cuticula being formed in the basal part of the old hair and partly inside the crust, as shown in the diagram. The traces of the old thread (*chorda*) may be seen in the old hair, while the new one is also visible.

In the so-called tympanal organs of the insects, the nerve fibre ends with a ganglion cell, from which runs out a peripheral process containing a hard rod, "*Stäbchen*." These organs, which will be de-

scribed in the next article, present, therefore, an evident resemblance to the nerve endings of the hairs as given by Hensen. Whether there is any real homology between them the future must decide.¹

Several authors² have described the sensory hairs on the antennæ of insects as auditory, but apparently without justification — and recently the olfactory function of these hairs has been quite satisfactorily demonstrated.³ Curiously enough they sometimes form invaginated groups, producing a vesicle with hairs projecting into it, and thereby acquiring a deceptive resemblance to otocysts. Indeed, Graber was misled by these pits in the common flies (*Muscidæ*) into terming them *otocystenartige Organe*.

¹ HENSEN, V.: Studien ueber das Gehörorgan der Decapoden. Zeitschr. f. wiss. Zool., XIII. (1863), 319–412. Taf. XIX–XXII.

² GRABER, VITUS: Ueber neue otocystenartige Organe der Insekten. Arch. f. mikros. Anat., XVI., 1878, p. 36. (Gives also the previous literature.)

MAYER, P.: Sopra certi organi di senso nelle antennæ dei Ditteri. Mem. Accad. Lincei Roma. 4 Maggio, 1879.

³ HAUSER, GUSTAV: Physiologische und histiologische Untersuchungen ueber das Geruchsorgan der Insekten. Zeit. f. wiss. Zool., XXXIV., 367–403. Taf. XVII–XIX. (1880).

THE NATURE OF THE HUMAN TEMPORAL BONE.¹

By ELLIOTT COUES.

So far from being in any respect original, the matters here to be advanced are common property to comparative anatomists. Yet they must be novel to those who have examined the subject only from the stand-point of human anatomy as commonly taught in the schools, or for the purposes of aural medicine and surgery. Resting as it does upon faulty and erroneous premises, the ordinary text-book lesson of the "temporal bone" is to be unlearned before the subject can be properly approached. Such instruction is thoroughly vicious in method, since it ignores the fundamental principles, and obscures the most important facts with a mass of wearisome descriptive details, too confused to be remembered, too crude to be digested, and in great part of the least possible significance. It is not easy to acquire sound and useful knowledge of this remarkable bone, even reading aright the lesson it teaches. I shall be happy if I can by any method of treatment place the subject before you in the bright light reflected by comparative anatomy upon matters which would remain in impenetrable obscurity but for this source of illumination.

The sphenoid bugbear of students is a plain and simple affair in comparison with the "terrible temporal," the intricacies and complexities of which constitute an anatomical *crux* that long engaged scrutiny, exercised inquiry, and baffled ingenuity, before the problem was put to the crucial tests required for its solution. This is by far the most diversely as well as most extensively compounded "bone" of the human body, composed of elements as numerous and as curious as the ingredients of a prescription in the classic days of medicine; but, unlike the latter, the formula of the temporal bone is of no uncertain plan or purpose. But no adequate idea can be acquired of

¹ In substance from lectures delivered from the Chair of Anatomy of the National Medical College, Washington.

its structure from examination, however minute and protracted, of the bone when all traces of its original composition have been lost by the consolidation of its elements. Such inspection is little more than a vacant stare at a singularly shapeless, meaningless figure of numerous parts, processes, and perforations, knowledge of which may indeed be gained by an effort of memory, but is not, therefore, an acquisition of the understanding. Nothing has so seriously retarded — indeed, has so effectually precluded — a correct appreciation of the nature of the “temporal bone” as the custom of describing it only under its final aspect, as divisible into “squamous,” “petrous,” and “mastoid” “parts,” with statement of the principal pieces which are separate at birth — without reference to the forms it wears in other vertebrates, — without distinction between intrinsic parts and extrinsic processes, — without recognition of the radically diverse elements which enter into its composition — without appreciation of the true relations of the “bone” to those about it. However sharply interrogated in such fashion, the temporal refuses to give up its secrets, the key to which is far to seek in the depths of embryology, by following link after link of the chain which comparative anatomy lets down into that living well of knowledge.

I must be as concise as possible in what I have to say; and, to bring out the leading facts in proper relief, it is best to strip the subject of much descriptive detail which may be as well or better learned in any reputable text-book. I must also resist the temptation to discuss the arguments, *pro* and *con*, upon which the Owenian, Reichertian, Petersian, and Huxleian schools severally base their views on the special homologies of the mammalian malleus and incus; for Huxley's¹ reconsideration of the subject seems to me conclusive.

To begin with, the term “temporal bone” is obviously objectionable, as applied to that group of bones called temporal. We will substitute the single word *CHRONOSTEON*.² Though this simply translates the Latin *os temporis* in one Greek word, it has not the disadvantage of implying unity where we mean plurality; for no idea of a single bone need attach to this new substantive term, which is, as a grammarian would say, “a noun of multitude, signifying many.”

¹ Proc. Zool. Soc. London, 1869, p. 391.

² Etym.: Gr. χρόνος, *tempus*, time; ὀστέον, *os*, bone.

For, as must be clearly understood at the outset, the chronosteon is not one homogeneous bone, a single bony unit or osseous integer, like a humerus or femur, for example, but a cluster or congeries of heterogeneous osseous elements, at some period of their development entirely separate and distinct bones, but finally consolidated in one indistinguishable mass (excepting the ossicula auditûs). The human chronosteon is more composite than that of any other animal is known to be. In lower animals, more or fewer of the bones which in man compose the chronosteon may be separate, or may be fused with surrounding bones, instead of with each other, or may be very different in their articulations and other connections. The human chronosteal bones, though completely fused in adult life, differ among themselves in origin, development, structure, position, relation, and function, being thus as diverse as are any other of the bones of the skull.

Thus, some of them, as the petro-mastoid and tympanic, belong to the auditory apparatus, or organ of hearing, constituting the otocrane, or skull of the ear — a special-sense capsule. Some others belong to the mandibular and hyoidean apparatus, which occur in man and other mammals under special conditions far remote from the generalized or primitive state of the parts in birds, reptiles, or fishes; the proximal mandibular and hyoidean elements being dissociated from their respective arches and devoted to the service of the organ of hearing as *phonophori*,¹ or sound-bearers, the so-called ossicula auditûs. One of them, the squamosal, is a membrane bone, closing a gap in the cranial wall, articulating directly with the mandible, and sutured indirectly with the maxilla. In strictness, none of the temporal bones pertain to the cranium proper, however closely incorporated therewith some of them may be, particularly the otocranic elements; for the three segments of the cranium, forming a vaulted tubular brain-case, or *neurocrane*, are morphologically complete without intervention of a chronosteon: so that the important part actually played in the formation of the cranial walls is rather by way of episode than in the necessary course of development; so that, again, the chronosteon might be excluded from such office without prejudice to its own morphological integrity or that of the cranium, and with loss of only its

¹ Etym.: *φωνή*, *sonus*, sound; *φόρος*, *ferens*, bearing.

least essential physiological rôle; for those parts which are not otocranic, or accessory thereto, are rather maxillary or mandibular or hyoidean than neurocranial, and the ear itself is primitively an involution of the integument.

The human chronosteon, therefore, consists essentially of the bony parts of the organ of hearing, in which are included, or with which are consolidated, portions of the mandibular and hyoidean arches; together with a membrane bone with which the maxilla is connected and the mandible is articulated; having only to do with the cranium proper in closing a gap in its walls. It is the hinges of the jaws and tongue melted into the skull of the ear.

In such view, the temporal bone-cluster may seem nebulous enough, and so it may remain to the physical eye; but back of that visual organ, remember, is the mind's eye, capable of resolving such a nebula into its component stars. Take a sidelong look, as you would to bring out the Pleiades clearly; dissociate the cluster from the neurocranial walls; associate it with bones of the jaws and tongue; compare its most essential part to the eye — the otocrane being quite homologous with the sclerotica,¹ though one is bony and the other fibrous, — and do you not see this remarkable “bone” in a new light?

First to define the position and relations of the chronosteon, then to dissect it and determine its bony elements — which will be to seek much farther than for the traditional “scaly,” “stony,” and “teat-like” parts, with their several borders, angles, surfaces, processes, foramina, and what-nots.

With few exceptions that only prove the rule, any bone is either on the median line of the body, and in itself bilaterally symmetrical, or it is lateral in position, asymmetrical in itself, and symmetrically paired with its fellow of the opposite side. This shapeless mass of bones answers the latter conditions. It is therefore situate at the side of the skull — but where?

In the very early embryo, the notochord extends along the floor of the skull as far as the sella turcica or pituitary fossa, embedded in a basilar plate of cartilage, the primitive basis cranii. Though no proto-vertebræ appear along this intra-cranial part of the chorda dorsalis, the

¹ The sclerotica of many animals below mammals has ossifications.

formation of the bony cranial walls proceeds in a manner which enables us to distinguish three segments of the brain-case quite analogous to, if not actually homologous with, any three segments of the spinal column or vertebræ proper. At not fewer than three points in the lengthwise axis of the skull, and in the basilar cartilage, are centres of ossific deposit, which furnish forth as many "bodies of the cranial vertebræ," forming the floor of the cranium. These are the basi-occipital, the basi-sphenoid, and the pre-sphenoid; the first, most posterior of these, long remaining separate from the rest to form the "basilar process of the occipital;" the other two speedily coalescing to form the "body of the sphenoid." As many lateral paired centres of ossification appear in the lateral extensions of the basilar cartilage, resulting in the pairs of ex-occipitals, ali-sphenoids, and orbito-sphenoids, — the first named of these being the parts of the occipital bone which chiefly circumscribe the foramen magnum, the other two corresponding respectively to the "greater" and "lesser" "wings of the sphenoid;" the three pairs of bones thus forming much of the walls of the cranium — so much as is preformed in cartilage. The arched vault of the brain-case is completed by membrane bones, namely, the supra-occipital behind, then the paired parietals, then the originally paired frontals. Such construction results in three rings, hoops, or arches into which the neurocrane is really divisible, — any young skull may be taken apart in such manner as to show them perfectly. These three segments are: I. *Occipital*, consisting of basi-, ex- and supra-occipital bones, constituting the "occipital bone" of the text-books. II. *Parietal*, consisting of basi- and ali-sphenoids, and parietals. III. *Frontal*, consisting of pre- and orbito-sphenoids, and frontals. When these cranial segments are in situ, the brain-case is closed in front by lateral expansions of an ethmovomerine plate, the "cribriform lamella of the ethmoid" — horizontal in man, otherwise in other animals. Behind, the cavity is continuous with that of the spinal canal. Inferiorly and laterally there is left a wide vacuity between segments I. and II. This is the exact site of the acoustic sense-organ, with its annexes, together constituting the chronosteon, which thus fills the gap between the occipital and parietal segments of the skull.

But these cranial segments, in very extensive series of animals, including man, have fixed relations to certain of the cerebral nerves and the organs of the special senses, enabling us to locate the chronosteon with still greater precision. Thus, the olfactory sense-capsule ("lateral mass of the ethmoid" including the "cribriform lamella"), and the exit from the cranium of the numerous olfactory nerves, is morphologically anterior to the frontal segment. The optic sense-capsule (eyeball) is morphologically between the frontal and parietal segments, its special-sense nerve passing out between the centres of ossification of the orbito and ali-sphenoid. Similarly, the acoustic sense-capsule is wedged in between the parietal and occipital segments, and the auditory nerve which enters it is correspondingly disposed with reference to the cranial segments. The otocrane, moreover, bears additional fixed relations to certain sensori-motor nerves, which, arising from the hind brain, are always either pre- or post-auditory. Thus, the third division of the trifacial passes out behind the centre of the ali-sphenoid, and before the anterior element of the otocrane (though actually through the foramen ovale in the sphenoid); while the glossopharyngeal and pneumogastric escape by the cleft between the posterior element of the otocrane and the occipital, called the "foramen lacerum posterius." By whatever special contrivances in different animals the first, second, and third divisions of the fifth and the tenth nerve may escape from the cranial cavity, the positions of their respective apertures of exit, relative to the cranial segments, are fixed, and the relation of the two last-named to the acoustic sense-organ is equally invariable.

It may be added here, that, in man and many other animals, a purely motor nerve, the facial, perforates the otic capsule together with the purely sensory (auditory) nerve, traversing the bone through the "aqueduct of Fallopius" (rather a *nerviduct*), and emerging upon the face by the stylo-mastoid foramen after giving off an important branch (chorda tympani) to the third division of the fifth, and making various sympathetic connections (principally by the Vidian). In man, again, the greatest afferent blood-vessel (carotid) of the brain, with its sympathetic plexus, bores a canal through the same capsule; while the greatest efferent vessel (internal jugular) passes out in a similar relation to this sense-organ that the pneumogastric nerve bears.

Thus positioned and circumstanced with reference to cranial segments, nerves, and vessels, the human chronosteon is principally connected with surrounding parts as follows:—

With bones of the posterior two of the three cranial segments (occipital, parietal) by fixed sutures extending around its general circumference, uniting it with the occipital, parietal, and sphenoid bones.

With bones of three facial arches, the maxillary, mandibular, and hyoidean. (1) With the maxillary bone indirectly, by the intervention of the malar bone; the zygomatic process of the temporal forming an abutment or pier whence, by suture, a bony bridge is thrown across the temporal fossa to abut by similar suture against the maxillary; the whole of this span constituting the zygoma, or zygomatic arch, connecting the squamous portion of the bone with the maxillary arch which is completed on the face by the apposition of the maxillary bone with its fellow. Such a zygoma, connected posteriorly with the squamosal, is characteristic of the class of animals to which man belongs, — a very different arrangement, by which the malar (then a slender rod) sutures with a quadrato-jugal¹ which articulates by arthrosis with the malleus, obtaining in lower vertebrates, as in birds for example. (2) With a portion of the mandibular arch by free arthrosis (“temporo-maxillary articulation”) with the rami of the lower jaw, the arch being completed on the face at the symphysis menti. A fibro-cartilage intervenes, and the joint is closed by ligament. This mode of direct connection of the principal jaw-bone with the squamous part of the temporal is peculiar to man and other mammals; lower among vertebrates, the mandible, in several pieces, articulates with the malleus, like the quadrato-jugal. (3) With a portion of the hyoidean arch by the seemingly insignificant but structurally important “*stylohyoid ligament*,” running from the “styloid process” to the lesser cornu of the hyoid bone, this arch being completed in front by the body of the hyoid. This ligament instructively represents a separate bone (epihyal) of the hyoidean arch in other mammals, and is often ossified as such in man.

¹ The quadrato-jugal is a sort of duplicate malar bone which enters into the formation of the zygoma in birds, etc., being interposed between the hind end of the malar, with which it sutures, and the quadrate (malleus), with which it has synovial articulation. It does not exist in man.

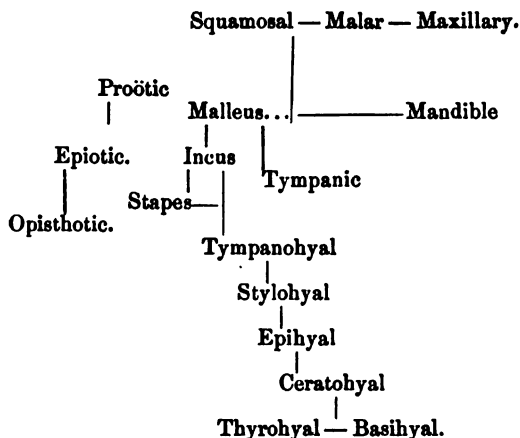
Not in man and other mammals, but in general in lower animals, there is (4) a connection of the chronosteon with the maxillary arch through the pterygoid and palatal bones. The human pterygoid is entirely separated from such relation, and confluent with the sphenoid, forming the "inner pterygoid process" of the latter. But in, *e. g.*, a bird, the pterygoid is a slender horizontal rod, synovially articulated in front with the palatal, behind with the quadrate (malleus). When this important quadrato-ptyergoideo-palato-maxillary chain of bones occurs, the (3) hyoidean connections may be entirely broken up.

The lesser ligamentous connections, and all the muscular attachments, may be passed over as not specially pertinent to my present purpose. The main point to be remembered respecting these connections of the facial arches is, that the apparent ends of all three of them come together in the chronosteon, — the maxillary by immovable suture with the squamosal, the mandibular by free articulation with the same, and the hyoidean by a long ligament. Thus, these three series of bones, which may be called *facial segments*, all hang to the chronosteon, being slung thereto as inverted arches beneath the overarching segments of the neurocrane or brain-case. The real ends of two of these arches are consolidated with or included in the chronosteon — but more of this matter in the sequel.

Thus the chronosteon is seen to unite the two great offices of auditory sense-organ and suspensorium of the facial segments. The latter office is still more conspicuous in those animals (below mammals) in which the mandible, the quadrato-jugal, and the pterygoid are all movably articulated with the representative of the *malleus*, as explained in the last paragraph but one above.

We are now prepared to resolve the highly complex chronosteon into its ultimate parts, of which there are several more than the textbooks admit, and show the morphological character of these numerous elements. The traditional division into "squamous," "petrous," and "mastoid" portions is as superficial as possible, and, moreover, incorrect. Any school-boy, one would think, on being asked to point out the "parts" of a temporal bone, would at least pitch upon the prominent styloid process as one of them, and would not be likely to dissociate petrous from mastoid. The old anatomists had a way of

The following rude diagram, though of course a good deal out of the way, may serve as a hint of the position and relations of these parts, and those of the maxillary, mandibular, and hyoidean arches:—



The *squamosal*, in man, attains unusual size, coincidently with the great expansion of the cranial walls, the vacuity of which between the ali-sphenoid and parietal it fills up as a thin, flat, scale-like or “squamous” bone, the upper curvilinear outline of which is free, beveled so obliquely for suture that the inner is much less extensive than the outer surface. The inner forms part of the middle fossa of the brain-case, and is impressed with the cerebral convolutions and meningeal arteries. The outer forms much of the temporal fossa, and is marked by the temporal muscle and vessels. Interest in the squamosal centres on the “glenoid fossa” for the articulation of the lower jaw. The relative dimensions of the squamous and zygomatic parts of the squamosal are in man the reverse of those which oftener obtain in other mammals, in which the former seems little more than an expanded foot of the latter. The zygomatic process stands out and then curves forward horizontally, ending jagged for suture with the malar. It is said to arise by three “roots,” whereof the posterior one curves upward and backward to circumscribe the temporal fossa behind; the middle descends behind the meatus auditorius to end opposite the Glaserian fissure, bounding the glenoid fossa behind, and consequently forming a *post-glenoid process*; while the anterior root, similarly bounding the glenoid in front by what are known as its “tubercle” and the

"*eminentia articularis*," forms a *pre-glenoid process*. These processes are not nearly so well marked in man as in many quadrupeds; in a badger, for instance, they nip the condyle of the jaw so closely that disarticulation is impossible. The smooth cartilage-coated recess between the pre- and post-glenoid processes, *in the squamosal bone only*, is the true glenoid fossa, the extent of which is greatly overrated in human anatomy by including in the name the smooth post-Glaserian plate of bone called the "*vaginal process*," which lodges a part of the parotid gland, belongs to the tympanic bone, and has nothing to do, morphologically, either with the glenoid or the jaw. The Glaserian fissure is the true boundary, being a slit or cleft between the squamosal and tympanic bones, in which is lodged the *processus gracilis* of the malleus. This is an important fact to remember; for we see here how really close in situation, though without actual connection, are the mandible and the malleus brought. The malleus is really, as I have said before, the proximal end of the mandibular arch, which in man and other mammals becomes disconnected from its arch, leaving the mandible itself to articulate directly with the squamosal. Such *proximity* of the malleus to the mandible is very suggestive of the true relations of these bones, here seen under those greatly modified conditions which have caused direct squamoso-mandibular articulation, — a relation only less close than that suture which the squamosal has through the malar with the maxillary, — the bony bridge thrown across the temporal fossa literally "yoking" the chronosteon to the maxillary arch.

The *tympanic* bone may be considered accessory to the otocrane, as it forms the *meatus auditorius externus*, or passage of the outer ear, and also part of the walls of the tympanum or cavity of the middle ear. At first a delicate ring, incomplete in part of its circumference, it develops into a tube which is firmly consolidated with the surrounding bones, especially with the periotic; the Glaserian fissure indicating a portion which is not confluent with the squamosal. In many quadrupeds, the tympanic becomes inflated to form a large osseous bulla, a conspicuous object on the basal aspect of the skull. In man, it preserves its cylindric or tubular form, as far as its cavity is concerned at least, the resonances which its dilation would give being

apparently provided for by the greatly developed mastoid cells which communicate with the cavity of the tympanum; but it sends down a large, smooth-faced, ragged-edged plate of bone called the "vaginal process," of which I have spoken above as being incorrectly included in the "glenoid fossa." The free outer end of the tympanic bone exhibits the circular orifice of the meatus externus, roughened for the attachment of the outer ear; the other end of the meatus is occluded by the tympanic membrane or ear-drum, shutting off the outer from the middle ear-passage. It is to so much of the tympanic tube as appears upon the surface that the name "auditory process" is applied in human anatomy.

The *petro-mastoid*, or *periotic*, makes up the great bulk of the chron-osteon — most of its internal, inferior, and posterior mass, described as distinct parts under the names of the "petrous" and "mastoid." The latter has no special morphological significance, being a development — a mere "process," if you please — of one of the three primitive elements of the periotic, though it attains extraordinary size in man by progressive inflation. This region of the skull is quite flat in children, but eventually acquires prominence, its most protuberant part being conical and nipple-like, and therefore called the "mastoid process." In its final shape the mastoid is of considerable extent externally, and internally takes some share in the formation of the cerebellar fossa; it sutures with the occipital and parietal bones; gives origin to numerous muscles, one of which, like the occipital artery, grooves the apex of the process; and is perforated by numerous foramina, one of which, of large size, transmitting a vein to the lateral sinus, is called the mastoid foramen; but it is very inconstant in position. The interior of the bone is hollowed into numberless cells, which communicate with the cavity of the tympanum. The whole mastoid region, or "mastoid portion of the temporal," is simply a postero-external outgrowth of the periotic, of which more essential and important parts are antero-internal, constituting the "petrous portion." The periotic develops from a mass of cartilage, situated in the basis cranii between the occipital and sphenoid, from three centres of ossification, which, however speedily and completely they may coalesce, as they do in man before birth, represent as many distinct bones, one

or more of which may remain separate in many animals. These are the *proötic*, the *epiötic*, and the *opisthotic*. The first of these is anterior, and in special relation with the corresponding vertical semi-circular canal. The second is superior and external. The third is posterior and inferior, in relation with the posterior vertical semi-circular canal. Their confluence completes a bony periotic capsule, inclosing the labyrinth or cavity of the inner ear. This is the triune *periotic bone*; with its mastoid developments the still only triune *petro-mastoid bone*; with its tympanic annex, the *otocrane*, or skull of the ear, containing the essential parts of the organ of hearing. The periotic proper corresponds closely enough with the "petrous portion of the temporal" of human anatomy, — the "petrosal bone," as it is sometimes called.

As I have said, the periotic capsule surrounds the labyrinth; but if the confluence of the pro-, epi- and opisth-otic were complete, a closed cavity would result, which is not the case. The outer wall of the labyrinth, *i. e.*, that which separates it from the cavity of the tympanum, is deficient in bone in two places, — one in the line of union of proötic and opisthotic, the other wholly in the opisthotic. These openings hence become landmarks. To the former, uppermost, of these apertures is given the name of *fenestra ovalis*; the latter, lower down, is called *fenestra rotunda*. Both are closed by membrane; and to the former is applied the foot of the stapes.

The periotic proper — if I may venture upon an extremely original observation — is called "petrous" or "petrosal" from its extreme density and hardness. In man, its exterior assumes the shape of a three-sided, three-edged pyramid, horizontal in position, and wedged head foremost into the recess between the occipital and sphenoid on the floor of the skull. The apex of the pyramid is frustrated by the jagged orifice of the carotid canal, contributing to the opening known as the "foramen lacerum medium;" its base is of course concealed. Two surfaces and an edge present inside the cranium; two edges are articular, and the third surface presents inferiorly outside the cranium. The free superior edge, to which the tentorium cerebelli is attached, sharply divides the middle cerebral from the posterior or cerebellar fossa. The anterior border articulates with the sphenoid;

and at its outer end, in the retiring angle it makes with the squamosal, are the orifices of two parallel canals leading into the tympanum, one the Eustachian air-tube, the other the passage-way for the tensor tympani muscle, separated by a thin plate of bone called the "processus cochleariformis." The posterior border makes defective suture with the occipital bone, the defect of apposition forming the foramen lacerum posterius, through which pass the ninth, tenth, and eleventh nerves, the internal jugular vein, and meningeal vessels. The smooth antero-superior surface is perforated for the passage of petrosal nerves; the superior semicircular canal makes a protuberance near its base, and near its apex the Gasserian ganglion rests on a shallow depression. The postero-superior surface presents the large smooth-lipped orifice of entrance of the seventh and eighth nerves (facial and auditory), therefore leading into the "aqueduct" of Fallopius as well as into the labyrinth; also some vascular foramina, one of which has received the fanciful name of the "aqueduct of the vestibule." In those animals in which the lateral lobes of the cerebellum are comparatively undeveloped, the so-called pneumogastric lobule or flocculus of that organ is received in a deep pit on this surface of the petrosal. The inferior surface (outside the cranium) is chiefly a broad, rough expanse of bone, excavated by the jugular fossa, and perforated by the large carotid canal and the small openings for the passage of branches of the glossopharyngeal and pneumogastric; while from nearer the apex arise the tensor tympani and levator palati muscles.

The usual descriptions of this bone would be more intelligible if stripped of their verbiage, and more intelligent if they discriminated between significant and insignificant particulars.

The six remaining bones—three ossicles of audition and the tympano- and stylo-hyal—belong morphologically to the mandibular and hyoidean arches. That is to say, they are actually parts of these arches in their primitive and generalized condition, reaching their extreme modification and specialization in man and other mammals. They consequently belong to what are called *visceral arches* by way of antithesis to *neural arches*—these opposite arches being developed on opposite sides of the series of vertebral centres.

A transverse section of the body is ideally a figure-of-eight, in which the centrum of a vertebra is the middle point, with a hoop, ring, or arch on the dorsal side inclosing a neural canal, and another on the ventral side, inclosing a visceral or hæmal tube. We have already seen three of these neural arches in the three cranial segments before described. Now, beneath the basis cranii are developed a series of visceral arches, ideally completing the lower loop of the figure-of-eight. So, therefore, to get at the remaining bones of the chronosteon, we have to approach the subject on another tack, from the opposite direction; and we may be sure this course will not only bring us to the bones in question, but will also lead us through the intricate ear-passages. In reading the following paragraph, I beg you to bear in mind how you might string a fish on a forked twig thrust in the gill-slit and out the mouth.

In the very early embryo, of man as of most vertebrates, certain folds or thickenings appear in the region of the fore-neck, on each side, and grow toward the middle line in front. These processes lie across the neck,—that is, their axes are transverse to the long axis of the body, and are separated by corresponding fissures. These folds are the *visceral arches*, and these fissures are the *visceral clefts*. Such structures are more numerous and persistent in the lower than in the higher vertebrates, in fishes, for example, some of them remaining to form the gills and gill-slits. They speedily disappear in man almost entirely; but, meanwhile, certain permanent structures are developed in the more anterior of the arches, and the cleft between the first and second arches persists throughout life. In the first or mandibular visceral arch is laid the foundation of the lower jaw. In the second or hyoidean is similarly deposited the elements of the hyoid apparatus; and the third arch is supposed to be represented by that part of the hyoid bone behind the lesser cornu. An outgrowth from the first visceral arch forms the upper jaw, thus circumscribing the cavity of the mouth. The hind end of the first visceral cleft persists patulous, and becomes the ear-passages, modified as meatus externus, tympanic cavity, and Eustachian tube, placing the cavity of the pharynx in what would be direct communication with the world through the ear, were it not shut off

by the membrana tympani. The auditory passage is not exactly a gill-slit, because the latter belongs to more posterior visceral clefts, the meatus of the ear being the remains of the most anterior one; but its morphological nature is the same. The Glaserian fissure belongs to the same category, being originally a cleft through which passes the important structure next to be considered — Meckel's cartilage.

In the first visceral arch appears a long, slender, cartilaginous rod called *Meckel's cartilage*, around which the future mandible ossifies. In vertebrates below mammals there are several distinct mandibular bones, forming a continuous series. Some or any of these bones are not represented in mammals, excepting the mandibular ramus proper. At the hinder (proximal) extremity of Meckel's cartilage, or in close proximity therewith, is developed a constant bone. This is the *malleus*. In the human foetus of five months, figured by Huxley, the malleus appears not only in direct continuity with Meckel's cartilage by its processus gracilis, but also as actually being the hammer-headed end of that structure; and we have noted above how slight is the dislocation in adult life — the slender process of the malleus lying in the Glaserian fissure close to the head of the mandible.

The actual condition of this bone in a bird, for example, is instructive as displaying its usual office, which is that of the suspensorium of both jaws. In any bird, the representative of the malleus, called in such instance the "quadrate bone," is a large, conspicuous object, entirely outside the ear and the skull itself, beneath the periotic region of which it swings freely by synovial articulation with the periotic bone. To the lower end of this hinge-like bone are freely articulated both the zygoma and the mandible; while to another part is freely articulated the pterygoid bone, — both zygoma and pterygoid being long, slender, bony rods, horizontal in position, connecting the malleus with the maxillary and palatal respectively. Some such arrangement, in which the malleus is manifestly the proximal bone of the mandibular arch and the suspensorium of the jaw, is the usual one in vertebrates. But in man and other mammals, the plan is abruptly and profoundly modified. The mandible is so dissociated from the proximal end of its own arch that the jaw articulates directly with the

squamosal; the malleus is withdrawn into the cavity of the ear, as an ossicle of audition, resting against the membrana tympani, with its slender process protruded into the Glaserian fissure, — which latter, you will remember, is simply a crevasse between the periotic, tympanic, and squamosal bones.

Referring to the diagram on p. 26, it will be seen that the mandible is connected to the squamosal by a black line, but that the dot line leads straight to the malleus, — the latter its generalized, the former its specialized, connective.

In quite like manner, a chain of bones is developed in the second visceral arch, forming the hyoidean series. The *incus* of man is the proximal bone of this series, standing in the same relation to the hyoidean that the malleus does to the mandibular arch. At the other end of the chain is the body of the hyoid bone, or *basi-hyal*, in the middle line of the body, like the symphysis menti. The details of the hyoidean bones vary so much in the vertebrate series that it will be well to take some animal near man with which to compare the human structure. The hyoid arch of a dog, for example, consists of the following pieces, after 1, the incus; 2, the *tympanohyal*, “a small cylindric piece of bone lying in a canal between the tympanic and periotic bones, immediately to the inner and anterior side of the stylo-mastoid foramen, and by its upper end firmly ankylosed with the surrounding bones. It can be seen much more distinctly in some dogs’ skulls than in others, and is more conspicuously developed in some other mammals. This I have called *tympanohyal*, as it is always in relation with the hinder edge of the tympanic bone, generally more or less embedded in it, and it extends upwards, embedded in, and afterwards ankylosed with, the periotic, to the hinder wall of the tympanic cavity. Its lower end is truncated and continued into a band of cartilage, which connects it with the proximal end of the bone which has generally been recognized as the uppermost of the series forming the anterior hyoidean arch;”¹ 3, the *stylohyal*, articulated below with 4, the *epihyal*, which is in turn articulated with 5, the *ceratohyal*, or “lesser cornu of the hyoid,” in its turn articulated with 6, the *basihyal*,

¹ Flower, *Osteology of the Mammalia*, p. 123. London, 1870.

or body of the bone, at the junction of the latter with 7, the *thyrohyal* or "greater cornu."

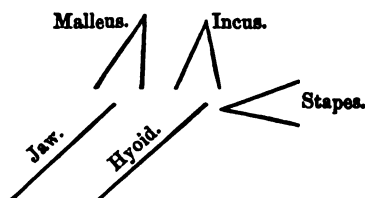
The human hyoid apparatus appears to differ only from the foregoing in the ankylosis of the *stylohyal* with the chronosteon, to form the "styloid process," and in the representation of the *epihyal* by the "stylo-hyoid ligament." As to the not generally recognized presence in man of a *tympanohyal*, I will quote again from Flower: "The tympanohyal can generally be recognized in the skull of an infant at birth, and for a few years after, as a cylindrical piece of bone, with a truncated lower extremity, about one-twentieth of an inch in diameter, seated in a depression in the hinder border of the tympanic, immediately to the anterior and inner side of the stylo-mastoid foramen. Its upper end soon becomes ankylosed with the periotic. The tympanic is produced around it anteriorly, constituting the 'vaginal process.'" (*Op. cit.*, p. 134.)

We thus see how the human "hyoid bone" appears to be entirely separate from the temporal group, though I have shown that parts of the hyoidean arch are among that group. It is simply because one link of the chain of bones is missing from man, the *epihyal* being represented by the "stylo-hyoid ligament," only exceptionally ossified. The arch which morphologically hangs inverted from the temporal is broken in the middle, its lower elements becoming the "hyoid bone," its upper ones remaining among bones of the ear-parts. It should be particularly added, that man is the only animal in which the stylohyal is known to be confluent with the chronosteon as a "styloid process," and such coössification does not always take place even in man. In fine, the most *human* thing about the human bone is, that it has a "styloid process."

A word as to the thyrohyal will not be out of place here, especially as it explains why the stylo-hyoid ligament runs to the lesser cornu of the hyoid bone, instead of to the end of the greater cornu. As said above, in low vertebrates there may be more visceral arches and clefts than in a mammal, and more of them may persist, as additional hyoidean or branchial apparatus. The human "greater cornu" or thyrohyal, is supposed to be developed in the third such arch, as the only vestige left of that formation. If this is so, man has a

persistent trace of a posterior hyoidean arch behind the well-preserved anterior one. But the ceratohyal or lesser cornu belongs to the latter; it is hence in the continuous chain of bones above considered, and consequently the stylo-hyoid ligament cannot but run to it.

The *stapes* is a peculiar bone, standing somewhat apart from the hyoidean series with which it is associated. In those vertebrates, below mammals, in which it occurs, it is usually a trumpet-shaped bone, applied by its expanded end to the fenestra ovalis, the slender rod-like end meeting the hyoidean apparatus at an angle, and *below* the proximal end of the latter. When thus trumpet-shaped, instead of stirrup-like in form, it is called the *columella*: but, whatever its name or style, it is a bone by which the fenestra ovalis is connected with a point in the course of the hyoidean arch, near, but not at the very end of, the latter. That part of the hyoidean rod which is above the point where the stapes joins, that is to say, the supra-stapedial part, may or may not ossify, in different animals; when it does ossify and become a separate bone, as in man, such bone is the *incus*. Such arrangement of the parts may be brought before the eye by a simple diagram.



It is just at this point of junction that is developed, if at all, the separate ossification forming the minute *os orbiculare*, often enumerated as the fourth ossiculum auditûs.

The malleus, incus, and stapes assume in man the special shapes which have caused them to be called respectively the "hammer," "anvil," and "stirrup." The latter mimicry is perfect. The incus looks more like a bicuspid tooth than any anvil, while the malleus somewhat resembles the upper part of a thigh-bone, with head, neck, short process for trochanter, and a piece of shaft — exclusive, of course, of the *processus gracilis*. But the verisimilitude of a hammer striking an anvil is very pretty, considering the vibratory impulse impinging from one upon the other. For I need scarcely add that these

bones, which are about the business to which they were bred when they serve as hinges of the hyo-mandibular mechanism, have assumed the office of conveying sound from the membrana tympani to the fenestra ovalis, upon the same principle and for the same purpose that a wire connects two telephonic instruments. But it is, of course, out of the question to go on now with the details of the structure of the organ of hearing, so cunningly inclosed in the chronosteon like the works of a watch in its case. My only object has been to open the case and see what's o'clock by the "bone of time."

WASHINGTON, D. C., *Christmas*, 1881.

ADENOMA AT THE VAULT OF THE PHARYNX.

BY F. H. BOSWORTH, M. D.,

NEW YORK.

FROM a number of cases of this affection, which have been under my care, I select the following as illustrating certain points in the clinical history and treatment of the disease, and as also affording a text for a brief discussion of some of its other prominent features:—

CASE I.—Mrs. H., a married lady, twenty-five years of age, came to me in January, 1880, for a catarrh which had troubled her for fifteen years, and for which she had been subjected to treatment at various times without relief. There had always been a more or less profuse discharge, both anteriorly and posteriorly, of thick mucus, but within two or three years back she had noticed that her voice was becoming affected. This change consisted in a loss of the nasal character. Her hearing was also becoming somewhat impaired. She also complained of a thick, swollen feeling in the throat, at some point which she could not locate; a feeling as of something lodged which she tried in vain to swallow. A rhinoscopic examination revealed a moderate amount of hypertrophy of the mucous membrane lining the nasal cavity, as far as it could be seen. There was also an extensive adenoma at the vault of the pharynx, obstructing fully one half of each of the openings of the posterior nares. The mass was of an irregular surface with rounded outline, and presented the gross appearance of an enlarged faucial tonsil. It did not extend to the opening of the Eustachian tube, nor was there any pressure upon or closure of that orifice. An examination of the external ear revealed a moderately depressed tympanum on each side.

I made applications to the tumor of nitrate of silver fused upon a flat and properly curved probe, and saw the patient once each week. At the end of one month I failed to detect any improvement. In making the application I tied the the palate after Wales' method by passing cords through the nares and out through the mouth, a manipulation which was quite disagreeable to the patient. After the failure of the nitrate of silver I made use of the galvano-cautery, using an ordinary flat bladed electrode, bent to the proper curve. The application was made through the mouth. I made four applications in this manner, and not feeling satisfied with the working of the electrode, I devised the one shown in the cut (Fig. 1).



Fig. 1. — The Writer's Electrode for cauterizing Adenoid Growths at the Vault of the Pharynx.

- A. — The instrument with the hood attached ;
- B. — The electrode with the hood removed ;
- C. — The hood, made of hard rubber.

The electrode I first used not only failed to destroy sufficient tissue, but on several occasions burned the palate on withdrawal. The instrument shown, as will be noticed, is mounted with a spiral blade in order to afford a large burning surface, but its main advantage lies in the flexible hood with which it is provided, and by means of which any contact with the soft palate is entirely prevented. When the electrode is passed behind the palate and pressed against the tumor, the platinum blade emerges from the hood, and is pressed into the mass. The instrument is now held in this position while the current is closed, the parts burned, and the current again broken. It can then easily be withdrawn without injury to the palate. This device also renders tying the palate unnecessary.

In Mrs. H.'s case I made eight more applications of the cautery at intervals of one week, with the result of completely removing the tumor. As a result of the removal of the obstructing mass, the voice became fully restored to its healthy nasal character, and her hearing also improved quite markedly, although no special treatment in that direction was given. Her catarrhal trouble was much benefited by the improvement in her nasal respiration accomplished by the removal of the tumor, but required further treatment.

CASE II. — Miss W., a young unmarried lady of twenty-four, the possessor of an unusually fine soprano voice which she is training for a professional life, came to me in May, 1881. For two years she had noticed that her voice was gradually failing, and yet was not able to locate the source of her trouble. The register was unimpaired, and there was no hoarseness or huskiness, nor was there any liability to colds or sore throat. She had for years had a moderate nasal catarrh, but had

never thought of it, as it gave but trivial annoyance. There was a noticeable absence of the nasal twang in her conversational voice, but she was not conscious of it. An examination of her throat revealed a fairly healthy larynx and lower pharynx. In the vault of the pharynx, however, there was discovered a mass of the size of a walnut, presenting the usual nodular appearance of adenoma. The tumor was rounded, somewhat pendulous, and overhung and partially occluded the posterior nares. There was no pressure upon the Eustachian orifice of either side, although her hearing was somewhat impaired.

My battery was out of order at the time this lady called. Indeed, "out of order" was its normal state, for at that time I was using a battery which gave me endless trouble. I therefore determined to make trial of chromic acid, the value of which had been highly praised in several articles which had come under my notice. The patient had a very unusually tractable throat, and submitted to manipulation behind the palate with remarkable control. I was therefore able to accomplish the canterization most thoroughly. This was done at weekly intervals until I left the city in July. There resulted a noticeable reduction in the size of the tumor, but upon seeing her again in September, the mass had increased in size to nearly its original proportions. I then determined to use Jarvis's snare, bending it to the shape shown in Fig. 2, and fitting it with a small loop about

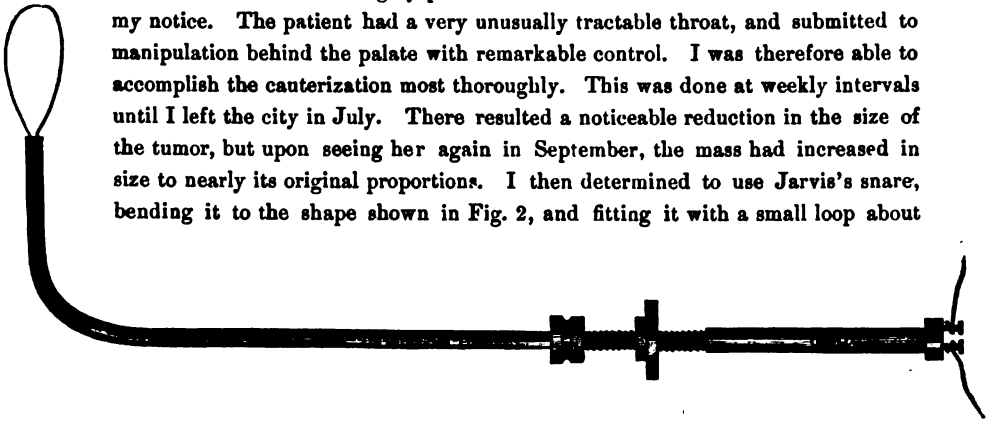


FIG. 2. Jarvis's Wire Snare, bent to adapt it for use in removing Adenoid Growths.

three quarters of an inch long. Without tying the palate, I passed the loop through the mouth to the pharyngeal vault, using a rhinoscopic mirror, and pressed the loop over the mass. The loop (No. 5 piano wire) being small, was quite rigid, and I was enabled to press it firmly to the base of the tumor, which was rapidly separated. I withdrew with the instrument a piece as large as a small chestnut, about one half of the tumor.

There was little hæmorrhage, and but trivial pain. Three days after this I removed the remainder of the mass in a similar manner. I made no application to the seat of the tumor, believing it to be thoroughly removed, and that there was no tendency to recurrence.

The result has been eminently satisfactory. She reports to me within a few days, that her voice has entirely recovered its strength and brilliancy. Moreover, she asserts that not only her head notes but that the notes of her whole register, are fuller and rounder than ever before, and that she can accomplish the more difficult movements, such as *pianissimo* and *staccato*, with an ease and brilliancy of finish such as she never possessed before. Her conversational voice has noticeably improved, as also her hearing.

Although the existence of glandular structure in the vault of the pharynx was recognized as far back as the time of Hunter, its anatomy was first accurately and minutely described by Luschka in 1868. Following Luschka's paper, Meyer, of Copenhagen, in 1870, gave an impulse to the study of the disease by publishing the results of some very elaborate clinical investigations of the subject.

In looking over the literature of the subject, which has grown to be somewhat voluminous since Meyer's paper was published, it would seem that there is some little confusion as to what constitutes a morbid condition of the glands in this region. That there is normally a mass of glands in the pharyngeal vault cannot be questioned, although in examining a large number of cases by the rhinoscopic mirror but a small proportion will reveal their presence. In most cases we see simply the rounded, dome-like cavity of the vault presenting a

smooth, unbroken surface; in others, we notice the surface covered with small, rounded elevations or ridges, separated by vertical fissures. These may be so slightly developed as to present mere irregularities of surface; or they may stand out prominently. In the faucial tonsil we notice the same features; it may be so small that it cannot be observed; or again, it may project from its bed between the pillars of the fauces quite noticeably; and still not constitute a morbid condition.

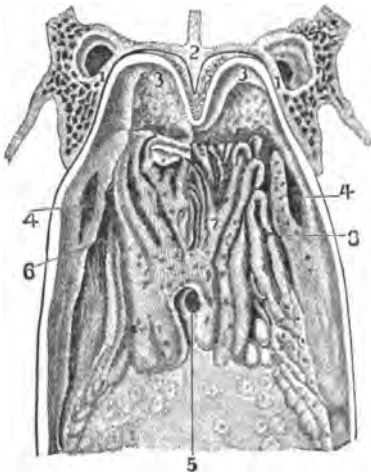


Fig 3. The Vault of the Pharynx (Luschka).

1. Pterygoid process.
2. Vomer.
3. Posterior portion of the roof of the nasal cavity.
4. Eustachian orifice.
5. Pharyngeal bursa.
6. Fossa of Rosenmüller.
7. The glandular structures which compose the pharyngeal tonsil.

The accompanying cut (Fig. 3), from Luschka's first contribution, gives a very accurate picture of a well-developed pharyngeal tonsil, as it has been called, and is one

which we may accept as representing the gross appearance of a condition of the glands of the pharyngeal vault which is consonant with

a perfectly healthy development. Certainly in many cases in which I have met with an appearance very similar to this, I have not been able to satisfy myself that there was any morbid condition. We may, therefore, meet in this region with conditions varying from this to one in which there is an entire absence, on gross appearance, of any glandular tissue, and in which the vault presents an unbroken, smooth surface. As there develop, however, morbid conditions, as the result of hypertrophy, the appearances change, and we find the glandular structures piling themselves up, as it were, and presenting large rounded masses, with a firm appearance not unlike that of an enlarged faucial tonsil, with the difference that it is spread out over a broader surface. It is not my intention, however, to discuss the diagnosis or rhinoscopic appearance of these growths. Meyer regards them as consisting of a true glandular hypertrophy, as do most writers on the subject. Woakes, of London, claims them to be of a papillary origin, in which view I believe him to be nearly alone. In the limited investigation that I have made on the subject, I have found them to be adenoid in character. The close analogy existing between the pharyngeal and faucial tonsil, and the gross appearance of the growths in the pharynx, would seem to lend weight to the view that they are glandular. It of course may be that we have both adenoid and papillary growths in this region, but I have never met with tumors here which presented any of the appearances of papillary growths.

The symptoms to which these tumors give rise are largely, I believe, due to mechanical obstruction to the current of air through the nasal passages. That there is any marked excess of discharge from an adenoid tumor, I think, is very doubtful. In fact, I believe the normal secretions to be to an extent diminished, the secreting function of the hypertrophied follicles being perverted.

The obstruction which these tumors cause gives rise to change of voice, mouth breathing, and impairment of hearing.

The change of voice consists in a loss of the nasal twang which is familiar to all. Meyer calls it a "dead" voice. The voice becomes almost entirely buccal in character. This is not so noticeable in buccal sounds, but, in those in which a nasal twang is prominent, is quite unpleasantly noticeable. Thus *am* or *an* becomes *ab* or *ad*.

Habitual mouth breathing, with its long train of evils, is as prominent a feature of the disease as of nasal stenosis from hypertrophic catarrh, and its mechanism the same.

The impairment of hearing so frequently met with in connection with the disease is not, as I believe, dependent on pressure upon the Eustachian orifice. Not only in this affection, but in enlarged tonsils and in hypertrophy of the nasal mucous membrane, accompanied by defective hearing, I have in a very large number of cases examined the parts by the rhinoscopic mirror, but I have never yet seen this orifice closed or pressed upon by these tumefactions. Indeed, it seems to me questionable if pressure, exerted by these soft, pulpy masses, would have much effect upon the cartilaginous ring which protects the posterior border of this orifice.

The true explanation of this symptom, it seems to me, lies in the rarefaction of the air in the middle ear, the indirect result of the obstruction to the normal current of air through the nose.

By the presence of an adenoma in the vault of the pharynx, or a hypertrophied mass on the posterior termination of the turbinated bones, the current of air which normally sweeps over the Eustachian tube is deflected from it. This orifice, then, lies, as it were, behind and under a hill. The air immediately about it, therefore, will become slightly rarefied by the to and fro current passing above it. Again, the freedom of action of the muscles of the pharynx is necessarily impeded by the presence of these tumors, and thus there arises another source of abnormal rarefaction of the air in the middle ear. The tendency of the contraction of the pharyngeal muscles in deglutition, especially the Levator palati, is to force air into the Eustachian tube, sweeping, as they do, against its orifice and producing closure. The palate at the same time is drawn up towards and adds to the tendency to press against this orifice, and thus force air through into the middle chamber. The unceasing action of vocal waves upon the tympanum would naturally tend to rarefy the air behind it, hence the action of the muscles of deglutition in restoring air to the middle ear would be a conservative one. The study of a very large number of cases by rhinoscopic examinations has led me to this course of reasoning to explain many things which have come under my notice. Cer-

tainly in the many cases of throat troubles with ear complication which have come under my notice, I have never been able to recognize tumors pressing on the Eustachian orifice.

Treatment. — I believe the analogy between the pharyngeal and faucial tonsil will hold quite as well in the matter of treatment as in the pathology and clinical history. It should be extirpated, and in the easiest way possible. The use of chemical agents is of doubtful value. Surgical methods are demanded. Of these there have been many presented.

Meyer, in his original paper, recommended the use of a small ring, with an inner cutting edge, mounted on a flexible rod. This could be operated through the nose or mouth. Michael recommends a double knife, arranged much as a pair of forceps. Hartmann, of Berlin, uses an ecraseur, consisting of a stout ring, containing a wire. Guye, of Amsterdam, and Böcker, of Berlin, use the finger nail. Justi, of Idstein am Taunus, prefers the use of a sharp spoon, resembling Semon's uterine curette. Tauber, of Cincinnati, prefers the galvano-cautery, but would gain freer access to the part by cutting through the soft palate and turning the flap to one side. Voltolini, Loewenberg, Michel, and many others, prefer the galvano-cautery. Mackenzie gives preference to the curette, similar to the one shown in Fig. 4.

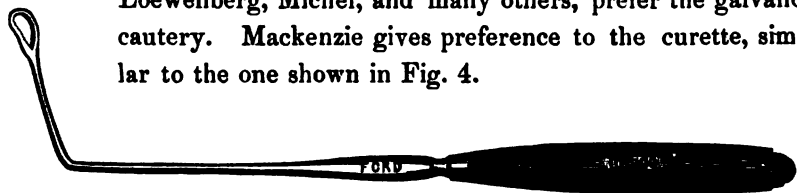


FIG. 4. Curette for the Removal of Small Adenoid Growths.

I do not propose to discuss these various plans of treatment. Since operating on Miss W. (Case II.) with the snare, I have operated on two cases, and with such excellent results that it seems to me to offer advantages over all other methods. Hartmann, as well as Hoppman, uses a similar method, but with the soft annealed wire, which requires manipulation. The piano wire, suggested by Dr. Jarvis, when he first introduced his snare, renders the use of this instrument extremely simple. It seems to me, then, that the wire snare should be used in all cases which admit of its use, namely, all cases in which the mass is sufficiently large to engage the loop. The op-

eration may be done without tying the palate, and without an anæsthetic. Either or both, however, may be used if necessary.

In those cases in which the snare cannot be used, or in which the whole mass cannot be gotten away by the snare, the galvano-cautery affords a method of destruction more rapid and more satisfactory than any other destructive method. For convenience of manipulation, and as affording safety to the healthy parts, the electrode, as shown in Fig. 1, has answered an excellent purpose in my hands. The galvano-cautery not being available, the curette shown in Fig. 4 has proved very serviceable in my hands. This is to be used by passing behind the palate, and is much the same as Mackenzie's curette, though when I had it made I had not seen his instrument. As regards any tendency to recurrence, I have never met with it, and doubt much if it occurs where the mass has been thoroughly removed.

26 West Forty-sixth Street.

OCCLUSION OF THE EXTERNAL AUDITORY MEATUS.

AURAL SERVICE OF DR. SAMUEL SEXTON, NEW YORK EYE AND EAR INFIRMARY.

REPORTED BY CHARLES ORR, M. D., RESIDENT SURGEON.

THREE CASES OF OCCLUSION OF THE EXTERNAL AUDITORY MEATUS.

CASE I. *Occlusion of the External Auditory Meatus from the closure of a Wound of the Ear, immuring a Wad of Cotton-Wool. Successful Operation.*—J. W., a truckman, aged thirty-nine years, a tall, strong, healthy man, weighing two hundred and twenty pounds, presented himself at Dr. Sexton's clinic, February 24, 1881. In obtaining his aural history it was ascertained that from the fourth to the thirteenth year he had frequently experienced ear-aches in both ears, with occasional purulent discharges. Since that time he has nearly always experienced tinnitus aurium on taking cold in the head. He has, however, always regarded his hearing as very good.

Six weeks before applying at the infirmary he fell from his truck to the pavement, a distance of six feet, striking on his left ear and the side of his face, receiving a wound of the left temple which must have severed a branch of the temporal artery, as the bleeding was very profuse. He was unconscious for an hour after the fall; and very considerable swelling of the face and temple soon took place, completely closing the left eye. On the fourth day after the accident a free sanguino-purulent discharge from the left ear was established and continued for four or five days, during which time a small round abscess formed about one inch in front of and a little above the left tragus. This abscess was now opened by the medical attendant, who stated that he had "squeezed out about one ounce of matter." The discharge from the ear ceased after the evacuation of pus from the abscess. The condi-

tion of the patient when first examined at Dr. Sexton's clinic was as follows: There was vertigo, especially on rising suddenly, and he could hear a loud voice only in the affected ear. The tinnitus aurium was very distressing, there was a feeling of fullness in the ear, but he experienced scarcely any pain. There is to be seen a linear cicatrix, about one inch in length, in front of the auricle, from the incision made into the abscess above alluded to; the parts beneath the cicatrix, and extending to the outer canthus of the left eye, are much indurated and sensitive to the touch, but not painful or discolored. The entrance to the left external auditory canal was found to be closed by an integumentary membrane, which had not the appearance of any recent inflammatory action; there was, however, a minute sinus situated at the upper and posterior margin of the probable entrance to the external auditory canal, through which a small silver probe was passed to the depth of half an inch, and on its withdrawal a small quantity of sero-purulent fluid escaped. The probe, when bent at a right angle a short distance from its point and reintroduced, showed that the chamber immediately beyond was of the same size of the canal of the opposite ear, and that the obstructing membrane was not over four or five lines in thickness. This membrane seemed to be a continuation of the common integument of the auricle, and when the parts were viewed, the bottom of the concha—which was rather large and shallow—appeared to be entirely without any opening. Inasmuch as the patient could give no account of the time when this closure took place, Dr. Sexton was at first inclined to believe that it had taken place in childhood, from the contact of the walls of the meatus while in an ulcerating state, as he had observed cases where closure to the entrance of the external auditory canal depended on this cause.

Having decided on an operation for the establishment of a useful entrance to the external auditory canal, Dr. Sexton—without using any anæsthetic—forced a narrow probe-pointed tenotomy knife through the minute opening which has been described above, and then by cutting in a direction backward and downward, forward and upward, to the point of departure, removed a circular

piece about one fourth of an inch in diameter. Care was taken not to remove any portion of the cartilage. The canal was now cleansed by removing with the syringe a considerable quantity of the blood following the operation and inspissated pus. Hearing was immediately improved. An exploration of the canal was postponed on account of the tenderness of the incised parts, and to prevent their closure a large silver speculum was introduced and held in place by a bandage. On the following morning the speculum was removed by the reporter, and after syringing the canal a small polypoid growth which presented itself was removed, together with some accumulations consisting of blood and pus. The speculum was then replaced.

When the patient returned to the clinic the morning after the removal of the polypus, it was found that the speculum had escaped from the canal, and the latter had, in consequence, diminished in size from the contraction and swelling of the tissues. An effort now made to replace the speculum was unsuccessful on account of an obstruction about half an inch from the meatus; this, on inspection, seemed to be a mass of *detritus* consisting of clotted blood, pus, etc., but when seized with the foreign-body forceps and brought away proved to be a large, firm wad of cotton wool thoroughly saturated with the secretions in which it was found. Normal hearing was immediately restored. The membrani tympani was found to be intact, macerated in appearance, but not inflamed.

Dilatation was now made by means of a cotton-wool tent prepared by winding absorbent wool tightly around the end of a wool-carrier until it would just pass into the meatus by slight urging; to facilitate its introduction and aid in the healing process a dressing of *Unguentum Calendulæ ex herba recenti* was ordered. The tent was to be removed daily, and the parts within thoroughly cleansed. It was several weeks before healing was complete, and the swelling in front of the ear disappeared, as well as the vertigo and tinnitus aurium, soon afterwards.

The but little changed condition of the wool found in the ear left but slight doubt that its insertion was of recent date, although the patient asserted that he had no knowledge of any having been put there since he was thirteen years old.

Complete closure of the external auditory meatus from traumatism or from adhesive inflammation in ulcerative otitis externa, is regarded by Dr. Sexton as of very infrequent occurrence. A case in point was seen at Dr. Sexton's clinic a short time after the above patient had been discharged entirely free of all aural symptoms.

CASE II. *Occlusion of the External Auditory Meatus of Fifty-four Years' Standing, from a Blow of a Horse's Hoof.* — H. H., aged sixty-two, came to the Infirmary July 14, 1881. He states that when he was but eight years of age he was thrown from a horse, his feet becoming entangled in the harness; while struggling to liberate himself the horse stepped on his head and severed (?) the left auricle from its attachment. The horse was unshod. The auricle, the patient stated, was cleansed and placed on the head again, where it was retained for a long time by bandages. Healing was very slow, the parts remaining more or less sore for eighteen months.

From its appearance, the auricle was restored in an unmutilated condition, but its new attachment was too far forward, the lower portion of the auricle seeming to cover the external auditory meatus. The tragus can be felt, but the entrance to the external auditory meatus is completely cased by integument, and its position cannot, without some difficulty, be definitely located. Ever since the ear was injured, the patient has been able occasionally to force some thin matter from the external auditory canal, through a minute sinus, by pressure in front of the tragus. Two years ago, when pressing thus upon the parts, something seemed to give way, and some wax came through this minute opening. Since then there has seemed to be an accumulation of matter in the canal, and some relief is obtained by squeezing some of it out. By pressing firmly on the integument covering the meatus he experiences a bitter taste in his mouth. At the present time there is a little tenderness over the left mastoid on pressure. Hearing on the left side is good for loud voice; on the right side about normal.

For the past three or four years the teeth have decayed rapidly, the gums are receding, and there are collections of tartar on the teeth. He has decided naso-pharyngeal catarrh, and the mucous membrane about the pharynx is thickened and hyperæmic. For the

past two years, and especially of late, he has experienced much tinnitus aurium in the left ear, but there has neither been pain or vertigo. He complains of having experienced for the past few years a burning sensation in the top of the head. Owing to the oral and nasal irritation, it might be expected that sympathetic aural trouble would at any time create such disturbances in the ear as to require an operation for the liberation of confined secretions in the external auditory canal. The presence of the bitter taste complained of in the throat, and the tenderness over the mastoid process, would suggest the advisability of performing an operation for the opening of the external meatus, but the patient, when made acquainted with the above prognosis, objected to having anything done for his relief.

CASE III. *Occlusion of the External Auditory Canal from Adhesive Inflammation during an Acute Otitis Externa during Infancy.* — Another case presented itself at Dr. Sexton's clinic in December, 1880, a girl aged thirteen. She had a discharge from the right ear at the age of three weeks, which continued off and on with greater or less severity until she was six months old. The ear was finally much inflamed just before the discharge ceased, and the auricle and neighboring parts became very sore and raw, and aggravated by scratching. The mother kept her lying on the affected (right) ear, so that she could not scratch the parts so much. This caused an adhesion of the raw parts about the margin of the concha, which, afterwards contracting, caused much deformity of the auricle. A physician in Germany, who was consulted a few days after the adhesions were observed by the mother, declined to separate them by an operation. Examination by a speculum shows that the external auditory canal is completely closed by a diaphragm of the common integument. It is situated about the junction of the cartilaginous and osseous portions of the canal, and is slightly concave and very smooth.

The hearing for loud voice in the affected ear is almost nil, yet she thinks she is conscious of hearing a sound when the end of a tube is placed over the ear, and the voice is directed through it; the vibrating tuning fork is heard when placed on the vertex. Hearing in the left ear is normal. Her health had always been good, but two months before her present visit she experienced pains in front of the

right tragus ; and ten days before her visit to the infirmary an indurated swelling, the size of an almond, appeared at the spot before complained of, very tender to the touch, and so painful as to keep her awake at night ; the pain was increased by mastication, and darted down to both the upper and lower jaw of that side. The painful swelling went away under treatment in about a week, when she was discharged cured.

In this case there must have been very serious injury done to the conductive mechanism during the progress of the aural disease. The swelling in front of the tragus seems to have been in some way connected with the ear, but its relations therewith were not clear. In all such cases Dr. Sexton is of the opinion that should middle ear trouble arise the cases would be much complicated by the closure of the external auditory meatus, and to provide against serious results in such an event he recommends that the canal should be opened without delay, when any symptoms, even if masked, point to inflammation of the above mentioned parts.

Book Notices.

ON THE RESULTS OF INCREASED INTRA-TYMPANIC PRESSURE AND THE FUNCTION OF THE SEMICIRCULAR CANALS. (*Ueber die Folgen von Druckerhöhung in der Paukenhöhle und die Function der Bogengänge.*) DR. BENNO BAGINSKY. Berlin. 35 pp.

A dog in the physiological laboratory of the Berlin Veterinary School exhibited during several months a rotation of the head and vertigo. A post-mortem examination showed the tympanic cavity entirely filled with a watery fluid while, macroscopically no changes could be found in the labyrinth or the brain. This led Baginsky to investigate the influence of increased pressure in the tympanic cavity, and, further, to examine the function of the semicircular canals.

For the experiments he used rabbits, into whose tympanic cavities he injected different kinds of fluids at different degrees of temperature. The auricle was incised, and after the bleeding ceased the membrana tympani was perforated; a tin syringe with conical nozzle, fitting hermetically in the meatus, was introduced, and the fluid injected. As sudden death may occur during the experiment from the injected fluid entering the trachea, causing suffocation, it is necessary either to compress the trachea or to perform tracheotomy. The former process is preferable, as the animals after tracheotomy do not live long. The fluids injected were water at 9–15° C., water at 37° or 38° C., the same with three fourths per cent. solution of chlor. sod., twenty per cent. solution of the same, dilute ammonia liquida, dilute muriatic acid, glycerine, and other substances. The results were as follows:—

Water of 9–15° C. Either during, or a few moments after, the injection there is a distinct turning of the eyes downward and inward or outward, with symmetrical nystagmus of both eyes. The number of movements varies from 30 to 150, the form of the movement is oscillating, and there exists a symmetrical twitching of the upper eyelid. At the same time there is observed a turning of the head with different degrees of intensity, in some cases only around the vertical axis, so that the occiput is turned toward the operated side, in other cases, also, around the sagittal axis, so that the eye on the operated side is turned downward and the other eye upward. The intensity of the symptoms depends upon the force used in injection. They last but a short time, the nystagmus disappears, and the head resumes its normal position. If the injection is re-

peated, the same symptoms occur in the same order and again disappear. If the animal is released it runs about, washes itself, and shakes the head, probably to rid itself of the water which still remains in the ear. If the injection has been made on one side only, and the pressure used not very high, the animal survives in a normal condition. When killed for the sake of making an anatomical examination, a purulent or hæmorrhagic inflammation is found in the tympanum, and a purulent, often sero-sanguinolent fluid, in the labyrinth and the cochlea, but nothing in the brain.

If the fluid is injected with much force, and especially if the injection is made on both sides, most of the animals die two or three days after the operation. Two of them showed oscillatory movements of the head, and could not keep it quiet. When pursued they stumbled and fell toward the operated side, or made whirling movements. On the third day after the operation the animals lay on the floor, having the head turned toward the operated side, hind legs entirely paralyzed and stretched out. The sensibility was notably increased, so that they would cry aloud when an effort was made to lift them from the floor by the nape of the neck. During these symptoms death ensued. The post mortem showed in every case distinct disease of the brain. The dura mater was injected and tense, and there was also œdema of the brain. The brain substance was serous, and much injected, the vessels of the pia mater enlarged and engorged. The inflammation of the brain extended along the corpora pyramidalia to the medulla spinalis.

If the water had a temperature of 37° to 38° C., and the pressure was slight, no symptoms followed; if the pressure was increased, the same series of symptoms occurred. But it was evident that all were less intense and passed away very soon, and most of the rabbits so treated did not show any signs of the operation during several months that they were under observation, although a few died a short time after the operation, showing symptoms of secondary disease of the brain.

The same result was obtained by the injection of warm water and three fourths per cent. salt. Only increased pressure induced the symptoms, and although secondary brain affection was mostly absent, yet a few died some time after the operation, exhibiting the same pathological anatomical appearances.

Solutions of twenty per cent. salt and more, induced the same result, only the intensity of the symptoms increased with concentration. A remarkable symptom was, that after some time the symptoms decreased and the animals appeared normal. But, by taking them up by the skin of the back and allowing them to swing free in the air, this movement commenced anew, and could be repeated in the same manner a number of times. In all cases death followed, usually more rapidly when the solution was more concentrated, and if in addition the fluids were injected at a lower temperature the entire series of symptoms was more intense. They were more severe if other fluids, like dilute ammonia liquida, dilute muriatic acid, or glycerine were used. Nystagmus often continued till death, which

occurred the same or the next day. The rotation of the head reached the highest degree, without returning to the normal position. In some cases there were circular and rolling movements around the longitudinal axis. The animals kept turning round in the room, and would not become quiet until they found a resting point in some fixed object, like the wall. One additional symptom was here observed: While in the preceding experiments there was no deviation in the visual axis, there now existed with the nystagmus a deviation, so that the eye on the operated side was turned downward and inward, the other upward and outward, and this continued until death. Entirely in correspondence with the severity of the symptoms shown in life, the pathological anatomical changes in the brain became more important. There was present œdema; strong injection of the pia, in some cases considerable hæmorrhagic focus in the dura and pia in the regions near the ear; hæmorrhage in the substance of the brain, extending from the corpus restiforme to the cerebellum and the fundus ventriculi quarti.

The results of the experiments can thus be stated: Different fluids injected in the tympanic cavity of the rabbit produce a distinct series of symptoms, *differing only* in regard to the time of their appearance, the intensity and duration, so that, while in some a slight pressure is sufficient to produce the symptoms, in other cases a much higher pressure is necessary. In a large number of cases the injections were followed by secondary inflammation of the brain and hæmorrhage, and these changes would occur more certainly, and with greater degree of severity, when the fluids used could exert a chemical influence.

Hence it follows that some of the fluid injected must have reached the brain, and that if the fluids were chemically neutral, no symptoms of brain affection followed, and the organism could easily recover. This explains why water at 37° or 38° C. and a three fourths per cent. salt solution of the same temperature do not, as a rule, produce brain symptoms.

In order to find out by what way the fluids had reached the brain, Berlin blue and ferrocyanate of potash were used. With the subsequent reaction with liquor ferri the result was, that in every case the blue color was found at the fossa jugularis, this being the place of termination of the aquæductus cochleæ, which begins in the fundus of the scala tympani of the first turn of the cochlea. Further, that the blue color was present in the entire aquæduct, while in the semicircular canals no trace of the blue color could be found. There are but two ways by which the injected fluid could reach the brain. Either the connection between the stapes and the fenestra ovalis or the fenestra rotunda must have given way. The resistance in the small bony canals, which serve for blood-vessels or nerves, is too great to admit of the passing of the fluids through them. But in every case it was found that the round window was ruptured, and this was evidently the passage which the fluid had traveled to reach the brain. The injection had passed through the fenestra rotunda in the labyrinth, and hence through the aquæductus cochleæ to the fossa jugularis.

The next series of experiments were made in order to determine the degree of pressure needed to produce nystagmus, the first symptom in the series previously described. For this purpose a thin glass tube was inserted and the fluids poured in. While water at 37° or 38° C., or a three fourths per cent. salt solution at 38° C., did not produce nystagmus, even when the column had reached two meters, water at 9° to 15° C. needed but 120 centimeters, — chemically different fluids like dilute muriatic acid or ferrocyanate of potash a pressure of 50 cm. only; this would hold good if one ear was treated in one way, and the second in the other way. It thus becomes clear that in order to produce the symptom of nystagmus two factors are necessary, first, a certain amount of pressure, and secondly, an irritation, depending upon the chemical character of the fluids, upon their temperature, or upon increased pressure when chemically neutral fluids are used.

Again, the anatomical examination showed that when nystagmus had been produced, the fenestra rotunda was ruptured, and that through this rupture the fluid had reached the aquæductus cochleæ and the brain. At this point the ferrocyanate of potash could be chemically demonstrated in the jugular fossa. And such a rupture is not astonishing, when it is considered that the far more resistant membrana tympani is burst by a pressure of a column of water of one meter.

If air is pressed in the tympanic cavity no symptoms are observed when the pressure is slight, but when it is much increased both eyes show a symmetrical turning downward and inward or outward, and nystagmus of short duration, which ceases when the pressure is discontinued, and returns when the air is compressed again. When this has been repeated four or five times, the eye on the operated side begins to show exophthalmos, and with each new compression bulges out a little further, the conjunctiva bulbi and palpebrarum becomes emphysematous, and dyspnœa and spasmodic jerking of the muscles of the body usher in death.

In only one case did the animal survive the operation two days, and the post mortem showed strong hyperæmia of the meninges at the base and convexity of the brain; the blood-vessels of the pia were much enlarged and engorged. In the medulla oblongata, near the corpora pyramidalia, the pia mater was discolored. In this series of experiments the fenestra rotunda, and sometimes the fenestra ovalis, were found to be ruptured, and air-bubbles could be seen in the fossa jugularis. The sudden death was probably caused by compression of the medulla oblongata by compressed air.

It might, *a priori*, be assumed that irritation of the dura mater is the cause of nystagmus and vertigo. Hitzig and Fritsch could produce contraction of the dorsal muscles, throwing backward of the head, and in some cases even movements of the limbs, and Baginsky has found the same, but neither mechanical, chemical, or electric stimulus could produce nystagmus or a turning of the head. These symptoms depend upon a direct brain irritation. Both pressure and irrita-

tion are needed, the pressure in order to rupture the fenestra rotunda, which opens the way to the labyrinth and the aquæductus cochleæ. If water at 38° C., or chemically neutral fluids are injected, the pressure must be considerably increased before the symptoms appear, and this increased pressure acts as a direct irritator of the brain. If, in addition to this, the fluids show a chemical influence, the irritation is increased and the symptoms last longer and become more severe.

The part of the brain which is affected is that nearest to the opening of the aquæductus cochleæ in the jugular fossa. In rabbits the crus cerebelli inferior, before blending with the medulla oblongata, is separated from the medulla by a distinct indentation. Above this transverse mark the surface of the corpus restiforme is covered with gray substance, the origin of the superficial roots of the acoustic nerve. Under this same place, about two to three mm. below, is the part which most interests us, namely, the middle of the free external margin of that part of the medulla oblongata, which on transverse section corresponds with the corpus restiforme nearest to the ascending root of the fifth. The investigations respectively of Magendie, Bernard, Schwahn, Curschman, Schiff, and Brown-Sequard, have already proved that injury of the corpus restiforme will induce deviation of the eyes; that injury of the fundus ventriculi quarti causes strabismus and superficial injury of the corpus restiforme on one side causes nystagmus, while cutting in the medulla oblongata, in the neighborhood of the tuberculum acusticum and the corpus restiforme, produces deviation of the eyes in such a way that the eye on the injured side is turned downward and forward, the other upward and backward; that when the medulla is injured the head will turn either toward the injured side or the healthy side, according to the location of the injury, and that movements around the longitudinal axis are produced especially when the injury of the medulla is in the neighborhood of the tuberculum acusticum, or after severe lesion of the corpus restiforme. Moreover, Hitzig has proved that nystagmus occurring in rabbits when the skull is opened is due to the difference of temperature. All the symptoms here described correspond with those in Baginsky's experiments, and so does the location of the injury as indicated by him. Consequently he believes that the symptoms arising from injection of fluid in the tympanum depend solely upon a lesion of the central organ.

Baginsky now continues his series of experiments in order to ascertain in what measure these same symptoms, occurring in injury of the semicircular canals, depend upon that lesion, and in how far it can be claimed that these canals constitute the organ of equipoise. The general result of these experiments is, that a lesion of the ear alone is no direct cause of the symptoms. Irritation of the membrana tympani, or of the tympanum itself, does not produce a disturbance of the equilibrium. The instillation of fluids which may exert a chemical influence in the meatus or the tympanum only produces pain, *until*, by diffusion, the fluids have traveled beyond the place of first application. As soon as this occurs there appear nystagmus, turning of the head, rolling or rotating movements, generally

several hours after the first application, and a post mortem shows severe inflammation of the brain caused by the different fluids. Not only does this late occurrence of the symptoms prove the diffusion, but it could be demonstrated directly in rabbits by introducing small pieces of *nitras argenti* within the tympanic cavity. After one or two hours there came nystagmus, turning of the head toward the operated side, stumbling and rolling. The nystagmus disappeared after two days, but the other symptoms continued till death, which generally followed on the eighth to eleventh day. There was found a high degree of inflammation and œdema of the brain. The tympanic cavity, the entire labyrinth, vestibule, canales semicirculares, and cochlea, were filled with *nitras argenti*, the bone was dark-colored and permeated with the nitrate.

Now there remain the labyrinth and the semicircular canals, the injury of which, according to Flourens, Cyon, and others, call forth similar symptoms of loss of equilibrium. As the canales semicirculares are hidden within the pars petrosa, and so near the cerebrum that they could hardly be injured without a simultaneous injury to the latter, Baginsky attempted to produce the injury through the *cavum tympani*. He found that rabbits do not make the best subjects for the experiment. After perforating the *membrana tympani*, he bored into the labyrinth with a sharp awl. Already during the operation there appeared nystagmus, and the eye on the operated side was turned inward, the other upward and outward; the head was inclined toward the operated side. The next day these symptoms continued, but on the third day the movements of the eye ceased, and did not return. On the fifth day pendulum movements of the head and stumbling toward the operated side. Death occurred the seventh day after the operation. The post mortem showed a rupture of the labyrinth and destruction of the cochlea. A communication existed between the labyrinth and the broken *porus acusticus internus*. The awl had penetrated directly into the brain cavity, and consequently there was diffuse meningitis and œdema of the brain. Another experiment resulted in the same way. He therefore now experimented on dogs, because in them the *bulla ossea* is easily exposed. To do this an incision was made about 2" long, parallel to the margin of the lower maxilla, beginning about $\frac{3}{4}$ " from the angle of the maxilla; the fasciæ were cut through and the muscles separated by tentacula. Deep within the *bulla ossea* can be felt, and after the periosteum has been removed the promontorium can be cut out with bone scissors. The entire tympanic cavity is now exposed, and any injury may now be possible.

In the first place the promontorium of the right ear was removed, and after the wound had sufficiently healed that of the left, so that both cochleæ were exposed. The animal lost his hearing but did not show any disturbance either of the eyes or the position of the body. During three months the dog was kept under observation and then killed. Both cochleæ were degenerated, and at the place of the promontorium there was a depression in the bone. The membranous *sacculæ* could not be found in the cicatricial tissue, but the entire labyrinth was filled with

a sero-sanguinolent fluid, in which the microscope showed red blood corpuscles, pus-cells, and fat granules. No change could be observed in the acoustic nerve.

In another dog the entire labyrinth, cochlea, and vestibule were destroyed. Immediately after removal of the cochlea, a high degree of nystagmus appeared, even while anæsthesia still persisted, and the eye on the operated side was turned downward and inward, the other upward and outward. No change was observed in these symptoms after further destruction of the entire labyrinth. From the porus acusticus internus, which had been broken during the operation, cerebro-spinal fluid escaped. When awaking from narcosis the dog fell upon the operated side and toward that side the head was also turned. The next day nystagmus and turning of the head continued, the dog stumbled and fell, generally on the operated side. By walking with the legs wide apart he tried to overcome this tendency to stumbling, and in this he succeeded when moving slowly, but when pursued would frequently stumble. On the third day nystagmus disappeared, but the other symptoms continued till death, which followed after one and one half months. Post-mortem examination: The tympanic cavity and labyrinth were transformed into cicatricial tissue; a fibrous tissue took the place of the cochlea; of the membranous parts of the labyrinth not a vestige could be found. Between the porus acusticus internus of the operated side and the labyrinth there had been an open communication, now closed by a cicatrix. Œdema of the brain, hyperæmia of dura and pia, discoloration and hæmorrhagic spots both at the base and convex portion. Also hæmorrhagic spots in the cerebral substance, especially at the posterior part of the occipital lobe near the cerebellum.

Repeated experiments always showed the porus acusticus internus partially or totally fractured and closed by cicatricial tissue, even when no other cerebral symptom was found. This is the cause of the cerebral irritation, and it is aggravated in this respect by the dragging on the acoustic nerve, when the cochlea is removed.

Hence follows, that destruction of the labyrinth does not cause disturbance of the equilibrium, so long as the brain itself is not affected. This affection is either a direct injury, which can be anatomically demonstrated, or it is caused by a dragging on the medulla oblongata and neighboring parts, when the acoustic nerve is torn through. The opinion that the canales semicirculares were the organ of equipoise, only originated from the idea that they could be injured without injuring the brain, which is quite impossible. If, after the experiments, an anatomical examination had been made of these parts whose injury, according to preceding investigations, disturbed the equilibrium, the opinion would never have prevailed. If the canales semicirculares, with their respective nerves, constituted a special organ for equipoise, just as the retina is the organ for light perception, the equilibrium would certainly have been destroyed in the dogs where the entire membranous labyrinth, utricle, saccule, and cochlea, were degenerated. This, however, was not the case. It is entirely immaterial whether the destruction of

the nerve terminations occurs slowly or rapidly, since only the final result has to be taken in consideration.

In those rabbits, where, in the first series of experiments, injections of water at 9° to 15° C. had been made, which survived, there was always found afterward a change in the labyrinth. Frequently the tympanum was filled with pus, and the labyrinth with a puro-sanguinolent exudation, and the membranous parts inflamed. In these cases the vestibular branch of the acoustic was irritated, and yet no symptoms of disturbed equipoise could be discovered, except those immediately after the operation, which disappeared in a very short time.

Physiological experiments, therefore, prove that the labyrinth, and especially the vestibular branch of the acoustic nerve, do not exert any influence upon the maintenance or disturbance of the equilibrium. For where such a disturbance did exist, there was either a direct injury to the brain, or indirect, in consequence of tearing and bruising; that is, in every case there did exist some lesion of the brain near the labyrinth. The same is confirmed by pathological facts, as, for instance, in the rare cases where the entire labyrinth became necrosed, and was expelled without disturbing the equipoise, and in others where the vertigo, having existed for a long time, disappeared after syringing the ear, cleansing it from retained pus, or by trephining the mastoid. Also in cases of Ménière's disease with temporary disturbance of the vision and hemiopia, only a direct affection of the brain can be indicated.

Having reached the conclusion that the disturbance of equilibrium in the experiments was due to an injury of the brain and not to the injury of the labyrinth, Baginsky now extends his investigations to pigeons. Since Flourens, all investigators have asserted that the superficial position of the semicircular canals in the pigeon allow an isolated injury of that part without simultaneous injury to deeper parts, and especially to the brain. The experiments on pigeons had given rise to the opinion that the canales semicirculares were the location for a special organ of equipoise. His experiments were taken with the greatest precaution to avoid complications, like hæmorrhage. He condemns the use of liq. ferr. mur. either as hæmostatic or to irritate the semicircular canals, on account of the great facility with which this fluid can reach the brain through the porous bones, and the peculiar formation of the aquæductus vestibuli. Sklarewsky describes in pigeons the so-called *cavitas meso-otica*, which he believes contained a part of the cerebellum, and from its peculiar position was almost invariably injured when the semicircular canals were experimented upon. Böttcher and Hasse, however, proved that the *cavitas meso-otica* is in reality the aquæductus vestibuli, which communicates with the *cavum epicerebrale* by a funnel-like opening. Hence there can be no question of a direct injury to the brain, but the forcible action required, especially in chiseling out the canals, may cause hæmorrhage, or the tearing and injury to the aquæductus vestibuli may extend secondarily to the brain.

One hundred and five pigeons served for the experiments. Baginsky divides

the symptoms produced into primary and secondary, the former caused directly by the operation, while the latter frequently do not occur until a few days after the operation. The most common period was between the fifth and the eighth day. It did not make any difference whether one horizontal or vertical canal was injured, or the injury inflicted on both sides, the head would rotate 180° to the operated side when the injury was unilateral, and to either side when both ears had been operated upon. The pigeon places its occiput on the floor and the beak takes a direction upward, and it retains this position of the head usually until death. The image corresponds exactly with that described by Goltz. It is very interesting to observe how these pigeons, when left alone, will sometimes bring the head back to a normal or almost normal position; they walk around the room, pick up grains, wash themselves, and then suddenly the head is turned again. They cannot fly, barely flutter and then describe circles in the air, mostly toward the operated side.

The anatomical examination performed a few weeks after the operation always showed the same result: purulent infiltration of the cranial bones, usually extending over the entire roof of the cranium; bones softened and air cells filled with a yellow, doughy, granular exudation. A cicatrix in the bone shows the place where usually the canales semicirculares are found, and only a few softened remnants of the canales semicirculares themselves are seen. Labyrinth totally infiltrated with pus, and the brain attacked by the spreading of the inflammatory process through the softened and infiltrated bones. Thickening of the dura of cerebrum and of cerebellum, increased vascularity of the same and connection with the bone at different spots. Pia mater thickened and discolored in spots. The processus lateralis cerebelli especially affected in unilateral operation, and if performed on both sides, then that side showed the highest degree of disease toward which the head was turned during life. In making the effort to remove the brain from its meningeal covering a small part of the lateral process often remains in the cavitas meso-otica (Sklarewsky), sticking to the thickened dura mater and the aqueduct of the vestibule. This is a highly interesting fact, because in normal condition no nerve elements are found in this place. The microscope shows here a fatty degeneration.

If the injury to the semicircular canals is very extensive and accompanied by hæmorrhage all the symptoms occur much sooner. In these cases hæmorrhagic spots are found under the dura, in the medulla oblongata at the entrance of the fourth ventricle, in the substance of the brain, and more particularly in the cerebellum, the processus lateralis, corpus quadrigeminum, and pons.

This rotation of the head, then, always proves a brain affection, either hæmorrhage in some part of the brain immediately after the operation, or secondary inflammations extending to the brain from the original place of injury. But the severing of any of the semicircular canals does not influence the rotation of the head.

There are still other ways to prove this. In one pigeon the left membrana tympani was destroyed. No symptoms occurred until the eighth day, when stumbling took place; the tenth day the head was turned; on the fourteenth day the pigeon died. Purulent infiltration of cranial bones and left labyrinth. On the left side of the cerebellum a spot of softening. In another pigeon one osseous canal was injured without any injury to the membranous canal; turning of the head the fifth day. Here, also, hæmorrhage in the aquæductus vestibuli and distinct fatty degeneration of the processus lateralis. Lastly, rotation occurs from direct injury of this process, immediately after the operation. In cases of the cockerel, described by Vulpian, and the pigeon described by Munk, so often quoted, it was afterward ascertained that both had sustained an injury of the head, which probably caused affection of the brain.

Finally, Baginsky made experiments in cutting one or both horizontal, and one or both of the vertical, canals. The symptoms following are very much alike, but no definite type can be given. Although in general after the section of both horizontal canals, the head oscillates in a horizontal direction, and after section of both vertical canals in a vertical direction, there are many exceptions, and sometimes even oscillation is entirely absent. Baginsky has made the subject of nystagmus a special study, because, according to Cyon, this symptom is caused by irritating the semicircular canals when they are cut, and the direction of the movements of the eye always corresponds with that of the injured canal. According to Baginsky this is a mistake. For in rabbits (the animal on which Cyon made his experiments) these canals cannot be cut without injury to the brain. It is not easy to observe nystagmus in pigeons. In a large percentage of experiments it did not occur, and when it did take place there was found hæmorrhage of the brain or the medulla oblongata, which explained the nystagmus. A correspondence, however, between the direction of the nystagmus and that of the injured canal did not exist.

Taking together all the symptoms which follow the section of the horizontal or vertical canals, it is shown that disturbance of the equilibrium in the trunk does not correspond to the position of the injured canals; the stumbling occurs in the same direction, whether horizontal or vertical canals are cut. The only correspondence seemed to exist in the oscillatory movements of the head, and this was not constant. If, therefore, the disturbance is the same for either canal, and the head movements do not always follow the direction of the injured canal, it removes another evidence in favor of the opinion that the canals form a special organ for equipoise.

It has already been stated that in the pigeon the injury to the cavitas meso-otica affects the brain indirectly. This cavity is the aqueduct of the vestibule, through which the endolymphatic space of the labyrinth communicates directly with the subdural space, and the endolymphatic fluid with the cerebro-spinal fluid. By the section of the canals this cavity is injured, and the brain cavity opened,

with escape of cerebro-spinal and endolymphatic fluid. After this escape the brain comes in direct contact with the base of the skull, and the respiratory movements of the brain produce friction, which becomes a mechanical influence or causes a dragging on the aqueduct or the acoustic. Hence we cannot even say that the primary symptoms depend upon injury of the canals. The effect of the section of a semicircular canal is sudden, and the brain feels immediately the result; if the section is made on both sides, both hemispheres of the brain are affected, especially those parts of the cerebellum that are situated nearest to the semicircular canals. It is difficult to explain the oscillatory movements of the head after section of two corresponding canals, the only symptom in which a direct influence could be recognized. If, however, the canals regulate the movements of the head, the symptom should be constant, which is not the case. Another fact, Baginsky observed two pigeons in whom there was first oscillation; this was followed by a rotation of the head, and this again, after several months, by oscillation. Gradually the head resumed its normal position, but the oscillation continued, until this also ceased entirely, and the pigeons appeared normal except that they never recovered the power of flight. If we consider that in some of the experiments rotation occurred at once as a primary symptom, without previous oscillation, it must be assumed that both depend upon the same central cause, and that there is only a difference of degree. In this way oscillation should depend upon superficial injury; if it is deeper, whether primarily or secondarily, rotation occurs, and if the inflammatory process decreases, again oscillation.

In the rabbits, where the first experiments with injections were made, there was rotation of the head and nystagmus from a secondary irritation of the brain, or from visible injury to the brain. In the pigeons there was generally hæmorrhage of the brain or inflammation extending from the primary injury. In pigeons there existed oscillatory movements which did not occur in rabbits, but oscillation and rotation are only different in degree, and may depend upon the fact that the movements of long-necked animals differ from those of the short-necked.

In the rabbits the pressure in the cranial cavity increased during the experiments, in the pigeons it was suddenly decreased, and both caused irritation of the brain. Finally, in the rabbit the perilymphatic system gave the communication, in the pigeon the endolymphatic system. In conclusion, as the result of his experiments, Baginsky rejects totally the idea that the semicircular canals can be considered as a special organ for equipoise.

The investigations in regard to the function of the semicircular canals made during the last few years by Goltz, Bernhardt, Mach, Breuer, Cyon, Longhi, Gowers, and others, all went to prove that the semicircular canals regulate the equipoise, and the latest, and one of the best, handbooks on diseases of the ear, that of Urbantschitsch, calls these canals "statisches organ." The experiments of Baginsky lead to an entirely different conclusion. This, however, can hardly surprise us, since all the above-named investigators in some cases failed to pro-

duce the symptoms they sought. Böttcher, who has made very important investigations, and with whom Baginsky agrees in numerous instances, did not believe that the end was reached when the semicircular canals were considered a special organ for equilibrium. Hensen is also in doubt. Keeping this in view, the reviewer has only endeavored to write an extract of all the experiments made, and conclusions drawn, which appear in the original.

J. J. B. V.

Reviews.

ON THE PRODUCTION OF HARMONIC TONES BY THE VIBRATION OF A FUNDAMENTAL TONE. (*Ueber die Erregung harmonischer Töne durch Schwingungen eines Grundtones.*) Rudolph Koenig, *Wiedemann's Annalen*. 1880. No. 13.

Dr. Koenig brings forward experimental evidence of the truth of Lebeck's view that a single tone can produce all the tones of its upper harmonics, but no deeper tone.

By direct communication through the air, an U_4 fork (128 double vibrations) with prongs fifteen millimeters thick was capable of exciting vibrations readily in harmonic forks up to the eighth (U_8) even when the fundamental fork was vibrating with an amplitude of but one millimeter.

To solve the preliminary question as to whether the vibration of the fork giving the fundamental was really simple, Koenig compared the curve drawn by the fork in the usual manner with a sinusoid, and with a curve constructed by the superposition upon this of the curves of the harmonics, and concluded that the fundamental tone was a pure one. To show that no transformation of the vibrations occurred in transmission by the air, the curve drawn by the fork directly was compared with that drawn by the membrane of a phonautograph upon which the sound was concentrated by the parabolic mirror. No difference could be observed. The same result was given by the manometric flame apparatus when the fork was first sounded in the air in the usual manner, and then connected with the membrane directly by means of a piece of rubber attached to one of the prongs.

Using Mayer's method of transmitting the vibrations from one fork to the other by connecting the forks by fine silk fibres, similar results occurred. The forms of the loops of the vibrating fibres showed that no harmonics were present in the vibrations of the fork itself.

The same action occurred when the tones were transmitted by the telephone by substituting the prongs of the forks for the telephone disc, and also when the vibrations were transmitted from the stem of the fundamental fork to a board and thence through the stem of the harmonic fork.

The article concludes with a description of a pendulum apparatus in which the vibrations of an ordinary pendulum with a heavy bob are made to excite harmonic vibrations in a flexible rod attached to its upper extremity. Both the pendulum and the rod record their vibrations upon a revolving cylinder. C. R. C.

ON THE BEATS OF CONSONANCES OF THE FORM $h : 1$. R. H. BOSANQUET. *Philosophical Magazine*, Nos. 70, 71, 1881. This is an important paper in which some light is thrown upon the difficult and vexed questions of the beats of consonances.

Ohm's Law is accepted by the author as in general approximately true, and in all probability absolutely true for sounds of small intensity. When two different sounds are heard together, if the sounds are of nearly the same pitch they are not heard according to Ohm's Law, separately and independently, but in the form of resultant displacements. If of equal intensity one sound is heard intermediate in pitch between the two primaries, and oscillating in intensity between a maximum and zero. These oscillations are the beats of imperfect unisons. As the notes separate in pitch at a certain point the two notes begin to be heard separately and independently, beside the beats. This phenomenon is accounted for by Helmholtz's theory of the separate vibration of different parts of the ear, and Bosanquet points out the important bearing of the direct determination of the interval which separates the region in which only resultant displacements are heard from that in which, in accordance with Ohm's Law, the notes are heard separately.

These experiments were mostly made with an enharmonic organ. The chief results are: 1. The critical interval at which two notes begin to be heard beside their beats, or resultant displacements is about two commas, throughout that portion of the scale used in music. 2. This critical interval appears not to be exactly the same for all ears. So far as the experiments go they are consistent with Helmholtz's assumption as to the degree of sympathy of the ear.

The author shows that the phenomena described are inconsistent with the assumption that beats arise only from the resultant forms exhibited by the superposition of the two vibrations on one receptive mechanism. When the interval increases the beats become fainter until at about an interval of about a minor third for the middle of the scale they disappear. That this disappearance is not the result of increased rapidity alone has been shown by Helmholtz. The contrary is, however, assumed, whenever Smith's or Young's theories of beats are admitted as sufficient explanations of the phenomena. In such cases it is forgotten (a) that the assumption carries with it another consequence than those which it was desired to explain, and (b) the explanation itself fails in an important point.

(a.) Were it true that a resultant displacement was alone received by the receptive mechanism of the ear, the primary notes would not be heard at all, and the single note heard would have the arithmetic means of the frequencies of the primaries.

(b.) Again, if the beats gave rise to a note as supposed by Koenig the pitch which should be observed is according to theory an octave below that actually produced.

The subject is also investigated by means of Donkin's harmonograph with the

following general results. In every case, whether of beats of unisons or beats of imperfect consonances, the examination of the curves shows a portion of a single harmonic curve lying through the vertices of the single resultant vibrations, which portion corresponds in duration to the beats as given either by Smith's rule or the ordinary rule for beats. In all cases the curves which correspond to the beats lie like a series of bows, one series at the top and the other at the bottom. The complete period of the pendulum-vibration of which each of these bows forms a part is always larger than the single bow or Smith's beat. Since no pendulum vibration can give rise to one of another period (if the forces are proportional to the displacements) it follows that in the present case if a term is found whose whole period is that of a Smith's beat, it must arise by transformation, i. e., through the presence of terms of higher orders than the first. This is substantially Helmholtz's explanation of the difference-tone which is identical with the lowest beat-note of Koenig. All of Koenig's beat-notes can be accounted for in a similar manner, by the assumption that terms of higher orders become important in the mechanism of the ear when the displacements are considerable. The beats of mistuned consonances may be regarded as springing from the interference of new notes which arise by transformation in the passage of the resultant forms through the transmitting mechanism of the ear, before the analysis by the sensorium.

A long series of experiments is then discussed. After a time the use of resonators was entirely discarded, as Mr. Bosanquet came to the conclusion that all beat-notes, combination-tones, and difference-tones of all orders are purely subjective, and are extinguished by resonators instead of being strengthened by them.

The conclusion is reached that the beats of mistuned consonances of the form $h : 1$, where h is nearly some whole number, consists mainly of variations of intensity of the lower note when the beats of the harmonics are eliminated.

In these last experiments notes were produced by the use of bottles as described in an article in the *Philosophical Magazine* for October, 1880. They are of moderate strength only, and so are free from the objections that are urged against Koenig's method.

As the notes used rise in the scale the range within which the phenomena are heard decreases. This is due to the fact that the displacements to which the higher notes give rise are much smaller than those of the lower notes.

The author then describes with some minuteness the arrangement of resonators used, and the difficulties that were encountered, and shows his reasons for coming to the conclusion that all forms of beats, beat-notes or difference-tones except the beats of approximate unisons have no objective existence.

The hypothesis of Helmholtz, who explains the production of combination-tones by the effect of a symmetry in the transmitting mechanism of the ear, is then considered mathematically and in detail. The author considers with Koenig and others that a weak point in Helmholtz's reasoning is the supposition that combina-

tion-tones of higher orders are produced by the combination of resultant tones of the lower orders with the fundamentals, the overtone, or with each other. In fact, the combination-tones, even of the lower orders, are far too weak to produce any such effect; and also the tones of higher orders are produced with the greatest intensity when those of lower orders are weak or evanescent. It is shown by analysis that the hypothesis of asymmetry leads to the development of combination-tones of the higher orders, in the circumstances under which they actually exist, and independently of the combination-tones of the lower orders. There are, in fact, six summation-tones and six difference-tones produced by the direct transformation of the primaries when the effect of terms up to the fourth order is considered. A force is developed by the influence of the higher terms which acts for a time corresponding to the duration of the beat, and as the beat is lengthened the effect of the transformation is increased. The actions occurring are further illustrated by the harmonograph curves.

The paper closes with the conclusions: (1) Forms exhibited by the resultant of two pendulum-curves do not as a rule exhibit any appearance corresponding to pendulum curves having the period of the Smith's beat, except in a very small number of cases, the conditions for which can only be fulfilled by accident; (2) The increases and diminutions of the maximum displacement which form the "bows" of the harmonic curves, correspond in duration with the Smith's beat, but not with the period of the harmonic curves of which they form part; (3) The variations of maximum displacement which are represented in these figures by the harmonic curves give rise by transformation to pendulum vibrations having the same frequency as those variations, these being the notes which Koenig called beat-notes and Helmholtz difference-tones of various orders; and (4) The actual beats of mistuned consonances of the form $h : 1$, as heard by the ear, are given rise to by the interference of these beat-notes or difference-tones with the lower note of the combination.

C. R. C.

ON THE OBSERVATION OF THE SOUND-WAVES IN ORGAN PIPES. (*Ueber die Beobachtung der Luftschwingungen in Orgelpfeifen.*) R. KOENIG: *Wiedemann's Annalen*, No. 8, 1881. — An organ pipe has a slit along its whole length, which is closed by placing the pipe horizontally in water. A V-shaped tube is inserted beneath the water and through the slit, and connected with a manometric capsule, so that by sliding the V-tube along the slit the changes in the air-vibrations at different points can be studied by the corresponding changes in the appearance of the flame. Of course the ear may be substituted for the capsule.

C. R. C.

EXPERIMENTAL RESEARCHES UPON TONES WHICH ARE PRODUCED BY THE PASSAGE OF GASES THROUGH SLITS. (*Experimentelle Untersuchung der Töne, welche beim Durchströmen von Gasen durch Spalten entstehen.*) W. KOHLRAUSCH.

Wiedemann's Annalen, No. 8, 1881. — The author studies the phenomena indicated in the title, varying the width and thickness of the slit, the pressure and the nature of the gas. The formula $n = k(u - u_0)$, in which n = number of vibrations of note, u = velocity of efflux, u_0 and k constants, applies within wide limits, k and u_0 vary with the width of the slit and nature of the gas. The production of sound in this manner is a phenomenon similar to the "wire-tones" investigated by Stronhal.

C. R. C.

ON THE HISTORY OF THE THEORY OF BEATS OF MISTUNED CONSONANCES. R. H. M. BOSANQUET : *Philosophical Magazine*, Vol. XII., No. 75. — The first portion of this paper considers the subject historically, while the second part is devoted to a consideration of Koenig's recent paper published in *Wiedemann's Annalen*, for 1880, p. 857, of which an abstract is given in the present number of this journal.

The early theory of Smith (1759) is first considered, and an attempt is made to clear away some of the obscurity surrounding it. The beneficial influence of Young's work is next alluded to. He pointed out the mode in which ordinary beats are allied to the combination-tones, but used an objectionable phraseology in saying that the beats *become* the combination-tones, as though the whole of the energy of the beats were transformed into combination-tones, which is certainly incorrect. The same criticism is applied to Koenig's position : and Bosanquet considers that Young's statements fully anticipate the great paper of Koenig on the subject. The position of Helmholtz is, in brief, that *all beats consist of variations of intensity of musical notes*, though this is rather assumed than definitely stated by him. The papers of Pole, in *Nature*, January 13 and 20, 1878, are mentioned as meriting attention, and a brief analysis of their contents is given, and a want of consistency of their assumptions with fact is shown to exist. Especially is this inconsistency seen in the reasoning of Pole, according to which unison-beats should consist of alternatives of fundamental and octave. The relatives of Pole's work to Smith's are also indicated.

In considering Koenig's paper on beats and beat-notes, a long list of errata in the original article in *Poffendorff's Annalen* (vol. clvii.), and in the translation in the *Philosophical Magazine* (5th series, vol. i.), is given. Bosanquet considers that in certain cases, at least, Koenig's notes were not absolutely pure simple tones.

The fundamental results of Koenig are in brief as follows : —

When any consonance formed by notes, having the relation of harmonic and fundamental, is mistuned, beats occur.

All such beats *may be regarded as* forming beat-notes of corresponding frequency, which become audible when their number and the intensity of the primaries are sufficient.

Two such beat-notes, when nearly forming unison, octave or twelfth, produce with each other secondary beats. These, in turn, may be regarded as forming secondary beat-notes.

Difference and summation-notes are regarded as independent of the beat-notes, and as being much weaker.

Beat-notes are regarded as not susceptible of explanation by difference- and summation-notes, since the frequencies do not correspond. (This is the proposition disproved by Bosanquet in his recent papers, of which an abstract appears in the present number of this journal.)

The audibility of beats is regarded as depending solely on their number and on the intensity of the primaries, and as being independent of the magnitude of the interval. This is certainly shown to be untrue by Helmholtz. (*Tonempfindungen*, 4th ed., p. 286.)

In several other respects beats are identified with primary impulses of the same frequency.

Bosanquet considers that these statements should be corrected, by saying that beat-notes are developed from beats by the transformation of a small definite portion of the energy of the beats into the beat-notes in the transmitting mechanism of the ear.

A paper by Sir Wm. Thomson (*Proc. Roy. Soc. Edinb.*, 1877-78, p. 602) is mentioned.

The rest of the paper is occupied with a discussion of Koenig's proposition, that a pure tone can excite also all the tones of its harmonic series. (*Wiedemann's Annalen*, 1880, p. 857.) Mathematically this is quite inadmissible, unless we admit either the impurity of the tone or the existence of transformation. If, however, in Koenig's pendulum with its spring-arrangement at the top, the pendulum contains the slightest trace of the harmonic corresponding period to the vibration of the spring, the spring will be caused to vibrate violently under its influence. Also a circular-pendulum cannot give a true harmonic motion, as this condition is realized only with a perfect cycloidal pendulum. The difference between the two is not negligible. Abnormal results may also occur if the force called into action by the bending of the spring is not strictly proportional to the displacement, or if the stand of the apparatus is at all unsteady.

With threads, as in Mayer's experiment, transformation is liable to occur, and will occur unless the full on the excited vibrator is strictly proportional to the displacement of the exciter.

It is quite true that in a hypothetical system in which the forces called into action are strictly proportional to the displacements, the fundamental harmonic vibration cannot permanently excite its multiples. This is unassailable as matter of mathematics; and as to experiment, we can only say that the nearer we approach to the construction of such a system, the less are the multiples excited by the fundamental. But the actual construction of such a system is impossible. And so far as our actual systems depart from the above condition, more or less, transformation does and must take place.

C. R. C.

NOTE ON THE LABORATORY AT ST. JOHN'S COLLEGE, OXFORD. R. H. M. BOSANQUET : *Philosophical Magazine*, Vol. XII., No. 74. — The article is of interest to all who are conducting researches in acoustics, as it contains an account of apparatus constructed for the author, and gives various practical results which he has reached regarding the construction of bellows, resonators, driving apparatus, etc. C. R. C.

ARROSION OF THE ARTERIA CAROTIS INTERNA, THE RESULT OF CARIES OF THE PETROUS BONE. (*Ueber Arrosion der Arteria carotis interna in Folge von Felsenbeincaries.*) HESSLER: *Archiv für Ohrenheilkunde*, Vol. XVIII., p. 1.

Stimulated by a case of caries of the petrous bone in which the patient died suddenly from an enormous hæmorrhage of the internal carotid artery, and also by the fact that similar cases interspersed in medical literature had never been brought together, Hessler has compiled a large number of observations on the subject by various authors, and has also given a history of his own case.

The cases are divided into three classes, the first contains thirteen cases in which autopsy confirmed the fact of the fatal hæmorrhage coming from the carotid; the second six cases where the confirmation by autopsy was wanting, but the diagnosis was in all probability correct; the third three cases where, it is true, there was no hæmorrhage, but the autopsy showed the osseous carotid canal destroyed and the artery itself surrounded by pus.

The first class includes the cases of Boinet, published 1837; Chassaignac, 1851; Toynbee, 1851; Toynbee, Baizean, 1861; Choyan, 1864; Broca, 1866; Busch, 1855; Pilz, 1865; Hermann, 1867; Crossmann, 1870; Sokolowsky, 1880. Hessler, 1881. The second class includes cases by Porter, published 1841; Marc See, 1851; Tüngel, 1861; Jolly, 1833; Hynes, 1870; Voltolini, 1881.

The third class includes those of Kimmel, 1805; Voltolini; Gruber.

An analysis of the first class, the only one which can be regarded as scientifically complete, shows that the age of the patients varied between 9 and 50 years, namely: Two of 10, two of 22, and five between 40 and 50; ages of the rest not given. According to sex it occurred eight times in men, and three times in women. In eight of twelve cases the rupture occurred eight times in the left and four times in the right carotid. The duration of the suppuration of the ear is given as nine, eight, seven, eleven, and nine years; in two cases as several months, and in one syphilitic person as only short.

The hæmorrhage generally occurred very suddenly, without any warning, and often without any reason, such as exertion; it varied in degree, in some cases was slight, in others severe. When slight it could be checked by a tampon in the meatus, when severe it required long continued digital compression of the artery in the neck. In most cases it kept recurring daily. In the cases of Boinet, Chassaignac, and Hessler, death resulted from an enormous single hæmorrhage which gave no time for any attempts to check.

Ligature of the carotid was performed in the cases of Baizean, Broca, and Pilz. In the first the left common carotid was tied, but the hæmorrhage recurred in twenty-four hours, and in three days was fatal. In the second case the right internal carotid was ligated and the bleeding checked to a slight oozing which was finally stopped by ice, and the patient died two months after from tuberculosis of the lungs which existed at the time of operation. In the third case the right carotis communis was ligated by Billroth, and there was no bleeding for nine days; it then began again, from the ear, mouth, and nose, and although checked by compression, kept recurring till, the fourteenth day, the left common carotid was tied; but three days after a severe hæmorrhage from the ear, nose, and mouth ended fatally.

It is impossible here, for want of space, to follow Hessler in his discussion of the treatment of these hæmorrhages, but from a consideration of the anatomy, and especially of the anastomoses of the vessels, he concludes that in severe hæmorrhages from the ear the common carotid should be ligated, although, even if this is done, a collateral circulation through the circulus arteriosis Willisii may renew the bleeding.

REMOVAL OF A FOREIGN BODY FROM THE MEATUS BY DISPLACEMENT OF THE AURICLE. (*Fall von Entfernung eines Fremdkörpers aus dem Gehörgange mit theilweise Ablösung der Ohrmuschel.*) MOLDENHAUER. *Archiv für Ohrenheilkunde*, Vol. XVIII., p. 59.

A child three and a-half years old, in play, put a pebble into the right meatus, which, by injudicious instrumental influence, was driven deep in, and a severe inflammation of the meatus set up. When the case came into the hands of Moldenhauer it was treated by removing a large granulation and by cleansing to subdue the existing inflammation; after this was accomplished efforts to remove by syringing and by means of glue were made without avail, the body being firmly impacted in the deepest part of the meatus. The child was then narcotized, and attempts with the syringe and lever again failing the auricle was displaced and the meatus opened in its upper wall as near the membrana tympani as possible; it was found, however, impossible to start the body from this point, and the meatus was then opened from above, backwards and downwards to its lower wall, the pebble pried outwards and removed with forceps. The wound healed by first intention, but the discharge from the meatus continued for two months, — the child was rachitic and scrofulous; only a slight narrowing of the meatus was visible; the membrana tympani, which had a large perforation, healed; the hearing certainly was fair in that ear, but an accurate test was impossible from the child's age.

Moldenhauer discusses the different methods of entering the meatus by displacing the auricle. The opening on the anterior wall he condemns from the necessary wounding of blood-vessels, injury of the parotid and branches of the facial,

and the close neighborhood of the articulation of the lower jaw, and also from the fact that the anterior lower wall is usually very convex towards the meatus, this curvature thus constituting a natural obstruction to the removal of a foreign body. This curvature of the bone is an objection to the method of entering the lower wall as suggested by Van Troeltsch.

The objection to opening the upper wall is that it is necessary to cut through such a depth of soft tissue that the difficulties of operating upon the body are much increased; again, the foreign body must be removed upwards, contrary to the laws of gravitation, and finally, the upper osseous wall cannot be enlarged without danger if such increased space should be necessary. All of these objections are avoided by the opening on the posterior wall, which gives a short, straight passage directly to the body. The only possible objection to this method is the probability of cutting the posterior auricular artery, in itself of no consequence.

In a note to Moldenhauer's paper, Schwartze says that he has performed the operation of displacement of the auricle not only for removal of foreign bodies, but also for the extraction of large sequestra and for the removal of exostoses in the deeper osseous meatus. In every case, he says, since the introduction of Listerism, healing has been by primary intention. He does not approve of chiseling away any part of the posterior osseous wall on account of the probability of cicatricial stenosis of the meatus, which, if otorrhœa exists, might be fatal.

DEHISCENCE OF THE TEGMEN TYMPANI. (*Zur Dehiscenz des Tegmen Tympani.*) FLESCH: *Archiv für Ohrenheilkunde*, Vol. XVIII., p. 65.

Attention is called to a possible source of error in previous observations on this subject. A true dehiscence, that is, a distinct opening through the tympanic roof, is extremely rare; careful preparation of fresh skulls shows not infrequently an extremely thin lamella of bone, often flexible, which on maceration disappears, leaving an opening. On twenty-seven recent skulls this extremely thin tegmen was found in four, two men and two women, while in only one was there a true dehiscence, and that opened not into the tympanum but into an air space in the cancellated structure.

STENOSIS OF THE MEATUS AUDITORIUS FROM HYPEROSTOSIS CRANII. (*Stenose des inneren Gehörganges durch Hyperostosis cranii.*) FLESCH: *Archiv für Ohrenheilkunde*, Vol. XVIII., p. 65.

All the bones of the skull were thickened. The petrous bone was thicker than normal, all its surfaces convex, and the meatus internus was a mere slit, while the aquæductus vestibuli was normal. The groove of the sinus petrosus superior was nearly obliterated; the hiatus spurius canalis Fallopiæ was invisible; the groove for the nervus petrosus superficialis major was a true slit running from the foramen lacerum anterius under the point of the petrous bone. A short account of the literature of similar cases is given.

SCALDING OF THE DRUM MEMBRANE (*Verbrühung des Trommelfells*). By F. BEZOLD. *Archiv für Ohrenheilkunde*, Nov. 8, 1881. — Two cases of this rare accident are reported by the author. The first is that of a boy, seven years of age, who, while playing, ran against the cook in whose hands was a vessel of hot milk, some of which was spilled over the right side of the child's head and face. He began almost at once to complain of severe pain in the right ear, and during the following two days the pain continued with scarcely any abatement of its severity. On the sixth day a discharge from the meatus made its appearance. Fourteen days after the occurrence of the accident the boy was seen by Dr. Bezold for the first time. All external evidences of the scalding about the head had disappeared, and even the external auditory canal presented no lesions of any importance. On the other hand, the greater part of the membrana tympani was lacking. In fact, only a narrow rim of drum membrane tissue at the circumference and along the manubrium mallei remained. In the vicinity of the short process this narrow rim of membrane was rather broader than elsewhere. The mucous membrane of the middle ear was swollen and of a deep red color. So far as could be ascertained from the boy's own statements, neither the ticking of a watch nor words spoken in a low tone of voice could be heard in the affected ear. When the vibrating tuning-fork was placed upon his head he referred the sound to the affected ear, but when the vibrations were allowed to reach the ear only through the air, he was unable to hear them except when the fork was held quite close to the ear.

The boracic acid treatment caused a cessation of the discharge in four days, and under a continuance of the treatment the healing progressed so rapidly that at the end of thirty-nine days from the commencement of treatment the drum membrane had been almost entirely reproduced: a mere pin-hole opening remaining in the anterior inferior quadrant. The patient was seen again after the lapse of another month, and even this small perforation was then found to have healed over, the newly formed drum membrane presenting all the appearances of a healthy membrana tympani. The hearing also was found to be comparatively little affected. Three months after this last examination Dr. Bezold again had an opportunity of examining the ear. To his surprise he found a circular perforation in the anterior inferior quadrant of the membrana tympani, extending from the umbo to within a millimeter and a half of the periphery of the membrane.

The second case reported is that of a woman, who, while lifting a pot of boiling soup off the fire, slipped, lost her balance, and fell backward. The hot soup poured over the right side of her head and face, and for two hours she lay on the floor in a state of unconsciousness. On awaking she noticed that she was hard of hearing in the right ear. In the course of four or five days the ear began to be painful, and a discharge showed itself. On examination, Dr. Bezold found the external auditory canal filled with pus, and ulcerated and swollen posteriorly near the orifice. Deeper in, the canal did not appear to be swollen. The greater part

of the drum membrane was lacking. A small mass of yellowish tissue still remained attached to the lower end of the manubrium mallei. In short, the appearances presented to the eye were almost precisely the same as those observed in the previous case. The plan of treatment pursued was also the same, and, on the 4th of May (the patient was first seen on the 15th of April) she had so far improved that the discharge was then insignificant, and the defect in the drum membrane much smaller than at first. The process of regeneration appeared to have taken place more actively in the upper than in the lower half of the membrane. On the 13th of May the opening, which was circular in shape and occupied the anterior lower quadrant of the membrane, measured only $1\frac{1}{2}$ mm. in diameter. In the course of the following month the discharge ceased entirely, but the opening in the membrane again became larger and of an elongated oval shape ($4\frac{1}{2}$ mm. in its longest diameter). The regenerated portions of the drum membrane presented essentially all the appearances of a normal membrana tympani. The hearing was very little affected.

In his remarks upon these two very rare and interesting cases, Dr. Bezold attributes the final enlargement of the opening in the membrana tympani to the retraction of the radical fibres of the regenerated substantia propria. As in cicatrices in other parts of the body this retraction does not take place in a marked degree until after the subsidence of all active inflammation.

ANNUAL REPORT OF THE OTIATRIC CLINIC OF PROF. E. ZAUFAL, FOR THE YEAR 1880. By J. HABERMANN: *Archiv für Ohrenheilkunde*, Nov. 8, 1881. — This report shows that a total of 1,149 patients (698 males, 451 females) were treated during the year. Of this number 476 (53.18 per cent.) were cured, 213 (23.8 per cent) were improved, 33 were still under treatment at the close of the year, 61 were not benefited by treatment, and 112 either died or left the Clinic before the results of treatment could be learned. Acute and chronic non-suppurative inflammation of the middle ear and Eustachian tube is represented by 365 cases, while there are 411 cases of the suppurative form of inflammation. From the tabulated list of operations, it appears that there were 20 for the removal of foreign bodies from the external auditory canal (13 by means of syringing, seven by means of instruments), one for the enlargement, by means of the galvano-cautery, of a narrowed meatus, 29 of paracentesis of the membrana tympani, seven of plicotomy (division of the posterior fold), eight of perforation of the drum membrane by means of the galvano-cautery, 19 for the removal of polypoid growths (15 with the simple wire snare, four with the galvano-caustic wire loop), 10 for incision of mastoid abscesses, five for the extraction of sequestra from the mastoid process, and eight of trephining that bone.

The report terminates with a detailed account of some of the more interesting cases.

INVESTIGATIONS REGARDING THE OCCURRENCE AND THE IMPORTANCE OF COCCOBACTERIA IN PURULENT OTORRHOEA AND THE THERAPEUTICAL INDICATIONS FURNISHED BY THEIR PRESENCE. By B. LOEWENBERG : *Archives of Otolaryngology*, September, 1881. — Loewenberg has been making microscopical examinations of the pus from furuncles in the ear, and has found that the coccus of furuncle deviates morphologically from that found in patients affected with otorrhœa; for instance, in constantly exhibiting greater dimensions. He has also examined carefully under the microscope the products of secretion of the affected organ in all patients coming under his care, in order to study the nature of the respective microphytes.

These experiments showed that in all cases were found the ordinary organisms of decomposition. In all cases of otorrhœa in which the cleansing of the ear is not done with the greatest care, and by the aid of suitable apparatus, the pus contains more or less great numbers of micrococci. If, in consequence of persistent neglect, the secretion is allowed to become offensive, the micro-organisms swarm in incredible quantities.

In suppuration of the middle ear, where the pus has undergone decomposition, all the coarser solid parts, particles of epidermis or aggregations of pus corpuscles were found invested with an envelope of closely packed but very small micrococci, which concentrically surrounds any and every particle of detritus to an equable depth, and in optical sections appears as a rather broad strip. Further examinations have shown this concentric gelatinous envelope to be constant in all cases in which the pus stagnates in the ear.

The writer says: "It seems to me that the gelatinous envelope (Zoöglœa, Cohn) is a product of secretion of the cocci or bacteria."

Besides finding the spherical bacteria as the peculiar typical concomitants of suppuration of the ear, rod-bacteria were found in a few cases.

EXFOLIATION OF THE NECROSED BONES OF THE EAR. OSCAR WOLF : *Archives of Otolaryngology*, September, 1881. — The author of this paper finds that the cause of exfoliation of these bones in most cases is due to the so-called exudative necrosis in scarlatinal diphtheria. The exudation is propagated from the pharynx through the tubes.

This diphtheritic process is not the only cause, for in twenty-eight cases analyzed by Wolf we find, scarlatina, eighteen; scrofula, two; typhus, two; measles, one; periparotitis, one; diphtheritis, one; acute tuberculosis, one; while in four there could be discovered no constitutional affection.

Exfoliation of the small bones rarely occurs without some constitutional disease. The *incus* alone was exfoliated six times in twenty-eight cases, while the *malleus* alone in two cases. Since the malleus is nourished not only by the vessels of the tympanum through the tympanic artery, but also from the external meatus.

In scarlatinal otitis there are three forms of disease.

(a.) The sub-acute form, with sero-mucous secretion, without a necessary perforation of the membrane.

(b.) Acute otitis med. purulenta, in which perforation of the membrane is rather due to the pressure exercised by the secretion than to erosion.

(c.) The exudative, necrosing form, in which either the membrane alone undergoes rapid and extensive decay, or is accompanied with a more or less deep-seated caries and necrosis of the bony parts.

The writer records several cases, and concludes that the human membrane makes wide excursions when exposed to the action of the explosive sounds, for it is only in this way that we can explain their extraordinary good perception.

The tests also prove the noteworthy fact that hearing may be very good even for weak tones, in spite of the loss of the malleus.

Wolf says : " I have never heard of but one case of a primary or slowly progressive constitutional affection, terminating with exfoliation of the small bones, unless an acute constitutional disease with acute otitis media had preceded it, although a few autopsies have favored the view of a primary ostitis of the small bones."

ABSCESS OF THE BRAIN IN CONNECTION WITH DISEASE OF THE EAR.
G. S. RYERSON, M. D., L. R. C. P. & S., Edin.: *Canada Lancet*, November, 1881. — The following case is of interest on account of the brain lesion following aural disease.

The patient, a child, was in a state of coma when first seen; ptosis of right eye, divergent squint, and dilatation of both pupils. The child, who was recovering from scarlatina, had been screaming with pain in the left ear for some days.

An examination of the left ear showed the membrane bulging very much. When punctured a considerable quantity of bloody serum escaped, followed by great relief.

April 5. — Five days later, the discharge had become purulent, pains in arms and legs, and on April 8 pain was first noticed in the mastoid. There was much tenderness over it and intense pain in the head. The mastoid was trephined and a brownish grumous fluid escaped; periosteum was detached and discolored; great relief followed. The next day the patient was much better, the ptosis almost gone, little or no pain in the head, but a profuse offensive discharge. No fever, skin moist and cool.

April 10. — Child complained that he could not see his nurse well; pupils dilated but contract with strong light; optic discs greatly swollen with enlarged and tortuous veins and arteries, which made the diagnosis of cerebral abscess almost certain. A small abscess on the arm and auricle were opened.

April 12. — Child passed a bad night, screamed all the time; discharge from the ear became less, fever and delirium commenced, and April 21st severe rigors were developed, and the child died.

Post Mortem. — Dura mater much thickened and adherent to calvarium. On its division much serum escaped; brain much congested, more on left hemisphere; ventricles full of serum, while beneath the pia mater, over each superior lobe, a small collection of degenerated pus was found. Lateral sinus full of blood clots and pus, and there was extensive caries of the roof of tympanum. The dura mater was extensively detached, and beneath it was much pus.

The case was a remarkable one, First, as an example of abscess of the brain following *acute* inflammation of the ear; Second, by reason of the remoteness of the collection of pus in the brain from the ear. Toynbee only reports one case where an abscess followed *acute* inflammation. Abscesses are generally found in the middle lobes, occasionally in the pons and cerebellum. It is probable that in this case the pus was carried by the veins, as there were symptoms of pyæmia.

Epileptic seizures were wanting in this case.

G. B.

ABSCESS OF THE MASTOID CELLS FROM THE USE OF THE NASAL DOUCHE. DR. A. M. ROSEBRUGH: *Canada Lancet*, August, 1881. — Dr. Rosebrugh records the following case: Patient, aged nineteen, had suffered for four years from naso-pharyngeal catarrh, and two years ago commenced to use the nasal douche, a teaspoonful of salt to a pint of warm water.

May 21. — He felt the solution enter the left ear. Two days after he was seized with severe pain, and on the 25th spontaneous perforation occurred with discharge of a dark sticky fluid. The pain, which was not relieved by leeches or hot applications, extended over the side of the head and also to the back and lower limbs. Patient also suffered from vertigo.

May 28. — There was some œdema of the lining of the external auditory canal, and two days later there was some tenderness over the mastoid. On this day an incision was made one half inch behind auditory canal, and an opening one sixth of an inch in diameter was drilled into the antrum. A large quantity of pus was evacuated, and patient experienced immediate relief.

When the fluid under pressure enters one nostril, the soft palate is elevated by reflex action, and if there is no obstruction the fluid passes out of the opposite nostril. If the pressure is slight there is little danger, but if considerable, as when the reservoir is much higher than the head, and if there is some obstruction to the free exit, then there is great danger of the solution passing through the Eustachian tube and also to the antrum.

When the douche is used, —

- 1st. The forehead of the patient should not be inclined forward.
- 2d. The bottom of the reservoir should not be higher than the eyebrows.
- 3d. The orifice of the nose-piece should not be large.
- 4th. Care should be observed that no obstruction exists in either nostril.

G. B.

Bibliographical Index.

BOOKS.

BARATOUX, J.

Pathogene des Affections de l'Oreille éclairée par l'Étude Experimentale.
Paris, 1881. 4to, pp. 119. 2 pl.

BREMER, V.

Om det patologiske Fund hos Døvstumme særligt i Danmark. Copen-
hagen, 1880.

FILIPPINI, J. B.

Contribution à l'Étude du Traitement de l'Otite Moyenne Suppurée Simple
par l'Acide Borique en Poudre. Paris, 1881. 4to, pp. 42.

HARTMANN, A.

Die Krankheiten des Ohres und deren Behandlung. Kassel, 1881.

MARTIN, A.

De l'Ozene Vrai. (Diss.) Paris, 1881.

MIOT, C., and BARATOUX, J.

Considérations Anatomiques et Physiologiques sur la Trompe d'Eustache.
Paris, 1881. 8vo.

SOCKEEL, A.

Étude sur l'Hématome de l'Oreille. Douai, 1881. 8vo.

THEOBALD, S.

Three Cases of Otomycosis Aspergellina successfully treated by the Insufflation
of Oxide of Zinc and Boracic Acid. New York, 1881. 8vo, pp. 8. (Repr.
from Am. J. Otol., 1881.)

JOURNAL ARTICLES.

ABBOTT, F. W.

Otorrhœa. Buffalo M. & S. J., Oct., 1881.

ADAMS, A. W.

Journal of a New Era in Otological Surgery, etc. Rocky Mt. Med. Rev.,
Denver, June-July, 1881.

A new Method of Treatment of Diseases of the Middle Ear with Impervious
Eustachian Tube. Rocky Mt. Med. Rev., Denver, July, 1881.

The great Reproductive Power of the Membrana Tympani; A New Method
whereby the Eustachian Tubes may be permanently opened, dilated, and

treated; Dry Catarrh now amenable to Treatment; Distressing and Long-standing Tinnitus Aurium relieved in a Novel Way, with Illustrative Cases. *Rocky Mt. Med. Rev.*, Denver, 1880-81, I., 364.

ANONYMOUS.

Cauterization of the Ear for Sciatica. *Schmidt's Jahrb.*, 2, 1881; *M. & S. Rep.*, July 16, 1881; *Qrly. Epit. M. & S.*, Sept., 1881; *Chicago M. Rev.*, Aug. 20, 1881.

The Discharge from the late President's Ear. (Two articles.) *Med. Rec.*, N. Y., Oct. 22, 1881.

The Sense of Hearing in Railway Officials. *Lancet*, Lond., Aug. 13, 1881.

BARATOUX, J.

De l'Influence des Lésions des Nerfs grands Sympathétiques et Trijumeaux et des Lésions du Bulbe Rachidien sur la Determination de certaines Affections de l'Oreille. *Trib. Med.*, Aug. 7 and 14, 1881.

BARGELLINI, D.

Una "Lepisma Saccharina" nell' Orecchio Umano. *Imparziale*, Firenze, 1881, XXI., 366.

BARGELLINI, L.

Otite Media Purulenta Consecutiva a Febbre Teforde. *Gaz. della Cliniche di Torini*, 1880, 44.

BASU, D.

Discharge of a Thin Watery Fluid from the Ear, and its Importance. *Indian M. Gaz.*, Calcutta, 1881, XVI., 225.

BEAUMONT, J.

Bored Ears, in Regard to Weak Eyes. *M. T. & Gaz.*, Lond., Dec. 3, 1881.

BERTHOLD, E.

Experimentelle Untersuchungen über den Einfluss der Nerven der Paukenhöhle auf die Vascularisation und Secretion ihrer Schleimhaut. *Ztschr. f. Ohrenh.*, Wiesb., 1881, X., 184. (Trans. by J. Furst.) *Arch. Otol.*, 1881, X., 184.

BEZOLD, F.

Zur operativen Behandlung der adenoiden Vegetationen des Nasenrachenraumes. *Aerzt. Intelligenzblatt*, 1881, 14.

Verbrühung des Trommelfells. *Arch. f. Ohrenh.*, Nov., 1881.

BEZZI, G.

Nuovo metodo curative di alcune forme di sordita. *Spallanzani*, 1 and 2.

BOUCHERON.

De la Surdi mutité sa Pathogenie et son Traitement. *Franc. Med.*, July 26, 1881.

BRANDEIS, R. C.

Report on the Progress of Otology during the Second Half of the Year 1882 (conclusion). *Arch. Otol.*, June, 1881.

BRUNNER, G.

Minor Otological Contributions. (Trans. J. A. Spalding.) Arch. Otol., Sept., 1881.

Durch Muskelaction hervorgerufene Binnengeräusche im_Ohr. Ztschr. f. Ohrenh., Wiesb., X., 175.

Complete beiderseitige Taubheit nach einem Fall gegen die Stirn. Ztschr. f. Ohrenh., X. 3, s. 171.

Commotio Labyrinthi durch einen Stockschlag auf die Ohrgegend; vorübergehende partielle Tontaubheit mit Schmerzhaftigkeit für tiefe Töne. Ztsch. f. Ohrenh., Wiesb., 1881, X., 174.

BURNETT, S. M.

An Abstract of the Papers on Otology read before the Section of Ophthalmology, Otology, and Laryngology at the 32nd Meeting of the American Medical Association, held at Richmond, Va., May 4, 5, and 6, 1881. Arch. Otol., June, 1881.

CASSELLS, P.

Des Maladies de l'Oreille au Point de Vue des Assurances sur la Vie. Cong. Period. Internat. des Sc. Med. Compt. Rend. Amst., 1881, VI., pt. 2, 293.

CHIARI, O.

Ueber Kehlkopfstenosen und ihre Therapie. Monatschr. f. Ohrenh., July, 1881, 71.

COOPER, R. T.

The Wisdom Teeth and Deafness. Dublin Jour. M. Sci., Sept., 1881.

COVE, A. S.

Application of Cotton Pellets in Destruction of the Membrana Tympani; Two Cases. Arch. Otol., June, 1881.

CZARDA, G.

Rhino-chirurgisches Etui; Abflussrinne f. Ohr und Nase. Ill. Viertel Jahresschr. der ärztlichen Politechnik, 1881, Heft 3.

DALBY, W. B.

Address on Diseases of the Ear. International Medical Congress. Lancet, Aug. 6, 1881.

DE ROSSI, E.

On the Use of Resorcin in Aural Patients. Arch. Otol., Sept., 1881. Ztsch. f. Ohrenh., Wiesb., 1881, X., 235.

DIXON, J.

"Audiphone." M. T. & Gaz., Lond., Dec. 10, 1881.

DUNCANSON, K.

Periscope of Otology. Edin. M. J., July, Sept., Nov., 1881.

ELY, E. T.

An Operation for Prominence of the Auricles. Arch. Otol., June, 1881.

FLESCH, M.

Zur Dehiscens des Tegmen Tympani. Arch. f. Ohrenh., Nov., 1881.

Stenore des inneren Gehörganges durch Hyperostosis Cranii. Arch. f. Ohrenh., Nov., 1881.

FRANKEL, E.

Anatomical and Clinical Contributions to the Knowledge of the Diseases of the Naso-pharyngeal Region and the Ear in Consumption. Arch. Otol. June, 1881.

GARCIA-DUARTE, E.

Extraction de un Profectil implantado en el conducto auditivo ; tentativas repetidas muchas veces sin éxito, durante tres años, para extraerle ; lesiones múltiples producidas por él en todo el oído ; muerte por meningoencefalitis supurada. Prensa méd. de Granada, 1881, III., 265.

GARDINER-BROWN, A.

The Sense of Touch as a Standard of Comparison for Hearing Power. Trans. Internat. Med. Cong., 1881.

GAZZI.

De l'Hypertrophie des Amygdales Considérée comme Cause de Surdit , Arch. Ital. di Laryngol., July 15, 1881.

GELL .

The Vagus and the Ear. Lancet, Lond., Nov. 19, 1881.

M thode Nouvelle pour l'Examen Fonctionnel de l'Appareil d'Accommodation de l'Oreille. Tribune Med., Oct. 23, 1881 ; Rev. Mens. de Lar., d'Otol., etc., Paris, Nov., 1881.

GIAMPIETRO, E.

Il sordomutismo considerato sotto il punto di vista della medicina. Gior. internaz. d. sc. med., Napoli, 1881, N. S. III., 619, 736.

Condition of the Membrana Tympani after Paracentesis. Giornal Internaz. delle Sc. Med., 1880, 8.

GLAUERT.

Zur Casuistik der Warzenfortsatzpolypen. Arch. f. Ohrenh., Leipzig, 1881, XVII., 277.

GOTTSTEIN, J.

Exanthematic Otitis. Arch. f. Ohrenh., XVI., 16 ; N. Y. Med. J. & Obs. Rev., July, 1881 ; Qrly. Epit. M. & S., Sept., 1881.

GOTTSTEIN, J., und K YSER, R.

Ueber die Geh rsverminderung bei Schlossern und Schmieden. Breslauer Aerzt. Zeitschr., 1881, III., 205.

GREEN, G. R.

Caries of Left Temporal Bone. Am. Pract., Louisville, Sept., 1881.

GREEN, J. ORNE. Recent Progress in Otology. Bost. M. & S. Jour., Dec. 22, 1881.

GRUBER, J.

Ueber einige neuere Behandlungsweisen des Ohrenflusses. *Monatschr. f. Ohrenh.*, July, 1881, 7.

GUDER, P.

Action of Quinine on the Healthy Human Ear. *Dissert.*, Berlin, 1880.

GUYE, A. A. G.

Du Vertige de Ménière. *Cong. Internat. d. Sc. Med. Compt. Rendu, Amst.*, 1881, VI., pt. 2, 313.

HABERMANN, J.

Summarischer Bericht du K. K. otitrischen universitäts Klinik des Prof. E. E. Zaufal für das Jahr 1880. *Arch. f. Ohrenh.*, Nov., 1881.

HACKLEY, C. E.

The Inhalation of Chloroform a Cause of Aural Disease. *Arch. Otol.*, Sept., 1881.

HARTMANN, A.

Deaf-mutism and the Education of Deaf-mutes by Lip-reading and Articulation. (Trans. S. P. Cassells.) *Dublin J. M. Sci.*, Nov., 1881.

Epistaxis, Plugging of the Nares, and their Relations to Affections of the Organ of Hearing. *Arch. Otol.*, June, 1881.

Pathology and Therapeutics of the Ear. (Report on the Progress of Otol.) *Arch. Otol.*, June, 1881.

Beitrag zur Untersuchung des Cavum pharyngo-nasale mit den Zaufal'schen Nasenrachentrichtern.

HEDINGER.

Verbesserter Hörmesser. *Ill. viertel Jahresschr. der arztlichen Polytechnik*, 1881, H. 3.

Report of the Institute for the Treatment of Diseases of the Ear. *Stuttgart*, 1880.

HEINEMAN.

Caries of the Petrouß Portion of the Temporal Bone following Chronic Ear Disease. *Med. Rec.*, N. Y., Dec. 3, 1881.

HERZOG, J.

Ein Fall von Ohrengeräusch, bedingt durch eine aneurysmatische Erweiterung im Bereiche der Arteria Auricularis post. sin. *Monatschr. f. Ohrenh.* Aug., 1881.

HESSLER.

Ueber Arroasion der Arteria carotis Interna in Folge von Felsenbeincaries. *Arch. f. Ohrenh.*, Nov., 1881.

HUGENTOBLE.

L'Audiphone. *Ann. Soc. de Méd. de Lyon*, 1880, 2 s., XXVIII., 47.

JACOBY.

Ueber Schwerhörigkeit von Locomotive-beamten. *Arch. f. Ohrenh.*, XVII., 4.

JONES, McN.

Catarrh of Middle Ear; Suppuration; Perforation of Membrana Tympani; Arrest of Discharge; Cerebellar Abscess; Death. *Med. Press & Circ.*, Lond., 1881, N. S., XXXII, 71.

KEGHEL, H. DE.

Dechirure Tympanique Gauche, Anæsthésie Acoustique droite Déterminées par une Même Violence Externe sur l'Oreille Gauche. *Ann. et Bul. de la Soc. de Méd. de Gand.*, March and April, 1881.

KELLER, C.

Ein Beitrag zur Casuistik der erworbenen Taubstummheit. *Berl. klin. Wochenschr.*, 1881, 40.

KIPP, C. J.

On Branchial Fistulæ at the External Ear. *Trans. Am. Otol. Soc.*, 1880.

KIRCHNER, W.

Beitrag zur Topographie der äusseren Ohrtheile mit Berücksichtigung der hier einwirkenden Verletzungen. *Verh. d. phys.-med. Gessellsch.*, N. F., XVI.

KNAPP, H.

The Cotton Pellet as an Antiseptic Drumhead. *Trans. Internat. Med. Cong.*, 1881.

Report of the Section for Diseases of the Ear at the International Medical Congress, held in London from August 3 to 9, 1881. *Arch. Otol.*, Sept., 1881.

Bilateral Rudimentary Auricle, with Absence of the External Auditory Canal. *Arch. Otol.*, June, 1881.

Die Höllensteinbehandlung des Ekzems der Ohren. *Ztschr. f. Ohrenh.*, Wiesb., 1881, X., 180.

LANGE.

Sur l'Emploi de la Méthode Galvano-Cautique dans le Nez et le Pharynx. *Copenhagen.*

LIEL, W.

On the Value of the Methods adopted for passing Air or Fluids into the Tympanic Cavity compared with the Method of passing them directly into the Cavity by Means of the Koniantron. *Trans. Internat. Med. Cong.*, 1881.

LINDSLEY, VAN S.

Chronic Suppuration of the Middle Ear and Yearsley's Cotton Pellets. *Tr. M. Soc. Tenn.*, Nashville, 1881, XLVIII., 37.

LOEWENBERG, B.

Investigations regarding the Occurrence and Importance of Coccobacteria in Purulent Otorrhœa and the Therapeutical Indications furnished by their Presence. Part I. Microscopical Appearances. *Arch. Otol.*, Sept., 1881.

Furuncul al urechei si furunculosa. *Progre sul. Med. Roman*, Bucuresci, 1881, III., 256.

LOEWE, L.

Embryology and Comparative Anatomy of the Ear. (Report on the Progress of Otolology.) Arch. Otol., June, 1881.

LORI, E.

Beiträge zu den pathol. Veränderungen der Rachen und Kehlkopfschleimhaut. Wien. M. Presse. 1880, 19, 12.

LUCAE.

Ueber optischen Schwindel bei Druckerhöhung im Ohr. Arch. f. Ohrenh., XVII., 4.

Casuistische Beiträge zur Bedeutung und zur operativen Entfernung der Exostosen des äusseren Gehörganges. Arch. f. Ohrenh., XVII., 4.

MACAULEY, S.

Case of Double Auditory Meatus. Specialist, London, Oct., 1881; Rev. Mens. de Lar., d'Otol., etc., Nov., 1881.

MAGNUS, A.

Ueber Methoden zur Bestimmung der Gehörschärfe. Cong. Périod. Internat. d. Sc. Med. Compt. Rend., Amst., 1881, VI., pt. 2, 305.

MASINI, O.

Di due ammassi ceruminosi del condotto auditivo esterno, complicati a diminuzione della sensibilità gustativa. Imparziale, Firenze, 1881, XXI., 485.

MÉNÈREZ, E.

Pierre introduite dans l'Oreille Moyenne, après Déchirure de la Membrane du Tympan; Cicatrisation presque Complète de cette Membrane par dessus le Corps Étranger. Cong. Périod. Internat. d. Sc. Med. Compt Rend., Amst. VI., pt. 2, 323.

De la Périostite Aiguë de la Région Mastoïdienne Consécutives à des Inflammations Diverses du Conduit Auditif Externe, seul, sans Lésions de l'Oreille Moyenne. Gaz. d. Hôp., Par., 1881, LIV. 684; Cong. Périod. Internat. d. Sc. Med. Compt. Rend., Amst., 1881, VI., p. 2, 327.

MICHEL, C.

Zur Behandlung der Krankheiten der Mundrachenhöhle und des Kehlkopfs. Leipzig, 1880.

MIOT, P.

Surdité Nerveuse par Congestion; Emploi de l'Électricité; Guérison. Rev. Mens. de Laryngol., d'Otol., etc., Paris, Nov., 1881.

Congestion des Oreilles Internes produite par des Détonations; Bourdonnements; Surdité; Émissions Sanguines; Pilocarpine; Guérison. Rev. Mens. de Laryngol., d'Otol., etc., Sept., 1881.

MOLDENHAUER.

Fall von Entfernung eines fremden Körpers aus dem Gehörgange, mit theilweiser Ablösung der Ohrmuschel. Arch. f. Ohrenh., Nov., 1881.

MOOS, S.

Remarks upon the Conclusions of Dr. Pollnow in his Paper, "Upon the Diseases of the Ear in Railroad Employés." *Arch. Otol.*, Sept., 1881.

MOOS, S., and STEINBRÜGGE, H.

On the Histological Changes in the Bony and Soft Parts of the Middle and Inner Ear in Caries of the Temporal Bone. (Trans. by W. C. Ayres.) *Arch. Otol.*, 1881, X., 121.

MORGAN, J. H.

Two Cases of Congenital Macrostoma, accompanied by Malformation of the Auricles and by the Presence of Auricular Appendages. *Brit. M. J.*, London, Nov. 12, 1881; *M. Times & Gaz.*, Lond., Nov. 19, 1881; *Lancet*, Lond., Nov. 12, 1881.

MUNK, K.

Ueber die Hörsphäre der Grosshirnrinde. *Monatsberichte der Berl. Acad. der Wissensch.*, May, 1881.

MUNSON, G. S.

A Case of Maggots in the Middle Ear. *Med. Ann.*, Albany, 1881, II., 113.

PAQUET, A.

Nouveau Procédé de Myringdectomie applicable au Traitement de l'Otit. Sccléreuse. *Ann. des Mal. de l'Oreille*, etc., Sept., 1881.

PARKER, F. L.

Abscess of Mastoid Process connecting with Post-Pharyngeal Abscess; Trephine applied; Recovery. *Trans. S. C. Med. Assoc.*, Charleston, 1881, XXXI., 104.

Case of Severe Otagia, Hemicrania, and Orbital Neuralgia, with Ear Cough, occasioned by a Flea on the Tympanum; Removal after Six Months; Prompt Recovery. *Ibid.*, 112.

POLITZER, A.

Die local Anwendung von Arzneistoffen zur Beseitigung der Mittelohreiterungen. *Corres.-Blatt f. Schw. Aerzte*, Basel, 1881, XI., 449, 485.

Behandlung der chronischen Mittelohreiterung. *Corres. Blatt f. Schw. Aerzte*, 1880.

Die Alkohol-Behandlung der Ohrpolypen. *Wien. Med. Blätter*, 1881, 1.

PUTNAM, J. J.

Cases of Fracture of the Skull. with Rupture of the Tympanum [Membrana Tympani] and Facial Paralysis. *Boston M. & S. J.*, Nov. 17, 1881.

RAYMONDAUD, J.

Convulsions Épileptiformes Symptomatiques de Corps Étranger du Conduit Auditif Externe. *J. Soc. de Méd. et Phar. de la Haute-Vienne*, Limoges, 1881, V., 130.

RAYNAUD.

Diabetic Otitis. *Ann. des Mal. de l'Oreille*, May, 1881; *N. Y. Med. J. & Obst. Rev.*, July, 1881; *Qrly. Epit. M. & S.*, Sept., 1881.

RETZIUS, G.

Contribution to the Knowledge of the Ear of the Vertebrata. Retzius and Braune's Arch., 1880, 2 and 3.

RICHET.

Tumeur Préauriculaire. Gaz. des Hôp., July 5, 1881.

ROBONE, T.

Special Report of the Contributions to Otology in Italy in the year 1880. Arch. Otol., June, 1881.

ROE, J. O.

Nasal Stenosis, its Influence on Olfaction, Audition, Vocalization, and Respiration, and its Treatment. M. Rec., N. Y., May 7, 1881.

ROOSA, D. B. St. J.

The Clinical Diagnosis of Acoustic Neuritis and of Atrophy of the Acoustic Nerve. Arch. Otol., Sept., 1881.

ROSSBACH, J., and ASCHENBRANDT, T.

Beiträge zur Physiologie und Pathologie der Schleimsecretion in den Luftwegen. Monatsch. f. Ohrenh., July, 1881, 7; Edin. M. J., Nov., 1881.

ROUSTAN (de Montpellier).

Nouveau Procédé pour faire les Injections dans l'Oreille Moyenne à travers la Trompe d'Eustache. Rev. Méd. Franc. et Étrang., Aug. 6, 1881.

SCHAEFFER, M.

Kehlkopfoperationen mittelst Voltolini's Schwamm Methode. Monatschr. f. Ohrenh., Aug., 1881.

SCHMALTZ.]

Trephining the Mastoid Process. Deutsch. M. Wochensch., Dec. 4, 1880.

SCHWABACH, D., and POLLNOW, H.

On Diseases of the Ear in Locomotive Engineers and Firemen. Arch. Otol., Sept., 1881; Ztsch. f. Ohrenh., Wiesb., 1881, X., 201.

SCHWARTZE, H.

Zweite Serie von 50 Fällen chirurgischer Eröffnung des Warzenfortsatzes Arch. f. Ohrenh., XVII., 1, 2, and 4.

SNELL, S.

Antiseptic Silk in Ophthalmic and Aural Cases. Lancet, Lond., Oct. 15, 1881.

STEINBRUGGE, H.

Normal and Pathological Anatomy of the Organ of Hearing. (Report on the Progress of Otology. Arch. Otol., Sept., 1881.

A Peculiar Condition of the Pavement Epithelium of the Endolymphatic Cavities in Man. (Trans. by W. C. Ayres.) Arch. Otol., 1881, X., 145.

STEVENS, G. T.

Ein Fall von Gehörnervengeschwulst in der Kleinhirngrube. Zeitschr. f. Ohrenh., VII., 290; Rev. des Sci. Méd., Oct. 15, 1881; Rev. Mens. de Laryngol., d'Otol., etc., Nov. 1881.

STRAWBRIDGE, G.

The Treatment of Inflammations of the Middle Ear; a lecture. *Med. Gaz.*, N. Y., 1881, VIII., 284.

TERILLON.

De la Surdit  chez les Employ s de Chemins de Fer (Chauffeurs et M caniciens). *Bull. et Mem. Soc. de Clin. de Par.*, 1881. N. S., VII., 549; *Bull. Gen. des Th rap.*, etc., Paris, 1881, CI., 164.

THEOBALD, S.

Suggestions regarding the Treatment of Suppurative Otitis. *Trans. Otol. Soc.*, Bost., 1881, II., pt. 5, 436.

TRAUTMANN, F.

Fibr se Polypen des Warzenfortsatzes durch den  usseren Geh rorgan nach aussen gewuchert. *Arch. f. Ohrenh.*, Leipz., 1881, XVII., 167.

TURNBULL, L.

Krankhafte Geschw lste des Ohres und ihre Behandlung. *Wien. Med. Presse*, 1881, XXII., 1133.

Morbid Growths of the Ear and their Treatment, with Cases. *Trans. Internat. Med. Cong.*, 1881.

URBANTSCHITSCH, V.

Zur Lehre von der Schallempfindung. *Pf ger's Arch. f. d. ges. Physiol.*, Bd. XXIV.

Ueber das An- und Abklingen acustischer Empfindungen. *Pf ger's Arch. f. d. Ges. Physiol.*, Bd. XXV.

VALK, F.

Substitutive Membrane in the Aural Canal. *Med. Rec.*, New York, Oct. 22, 1881.

WALB, H.

Zur Aetiologie der Nasenblennorrh . *Arch. f. Ohrenh.*, XVII., 4.

WEIL.

Vorl ufige Mittheilung  ber die Resultate der Geh runtersuchung an 4500 Schulkindern. *Monatsch. f. Ohrenh.*, Aug., 1881; *Med. Corr.-Bl. d. W rttemb.  rztl. Ver.*, Stuttgart, 1881, LI., 212; *Gesundheit*, Frankf. a. M., 1881, VI., 225.

WILSON, F. M.

Three Aural Conveniences. *Arch. Otol.*, Sept., 1881.

WINSLOW, W. H.

A new Mastoid Curette. *Hahnemann Month.*, Phila., 1881. N. S. III., 454.

WOLF, O.

Physiology of the Ear and Physiological Acoustics. (Report on the Progress of Otology.) *Arch. Otol.*, June and Sept., 1881.

On the Exfoliation of the Necrosed Small Bones of the Ear. *Arch. Otol.*, Sept., 1881; *Ztsch. f. Ohrenh.*, Wiesb., 1881, X., 236.

WYNNE, W. H.

Practical Deductions drawn from One Thousand Digital Examinations of the Pharyngeal Orifice of the Eustachian Tube and Fossa Rosenmüller. Boston M. & S. J., Nov. 17, 1881.

ZAUFAL, E.

Ueber die Wichtigkeit der Untersuchung des Auges für die Diagnose und Therapie der Krankheiten des Gehörorgans. Wiener M. Presse, 46, 1881.

Ueber den Werth des Nitze-Leiter'schen Endoscopes zur Untersuchung des Gehörorgans. Arch. f. Ohrenh., XVII., 3.

Ueber die in der Prager Klinik f. Ohrenkranke beobachteten Fremdkörpern des äusseren Gehörganges und der Paukenhöhle. Prager Med. Wochenschr., 1881, 34 ff.

Notes.

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As it is important that the Bibliographical Index should be made as complete and as correct as possible, notices of errors in or of omissions from the Index are requested from the readers of the JOURNAL, and these should be sent to Dr. FRANCIS H. BROWN, Hotel Lyndeboro, Boston, Mass.

At the close of each volume of the JOURNAL there will be given a *résumé* of the otological literature of the year, in which will be presented a quantitative analysis of this literature, with reference to nationalities, and with an attempt to sketch the rise and fall of the interest evinced in certain special topics as shown by the number of separate publications and journal articles published during the year.

In the article published by Dr. BUCK, on "Sudden and Complete Loss of Hearing in one Ear, during an attack of Mumps," in Vol. III., No. 3, of this journal, the remark is made that "even Schwartze, whose experience must have been very extensive, speaks of the complication in terms which would lead one to infer that he had not seen an instance of it." This inference, as Dr. BUCK has learned by a personal communication from Professor SCHWARTZE, is not correct. On the contrary, the latter has seen a number of cases in which "Acute Monolateral Nervous Deafness" has developed in the course of an attack of mumps. — EDITOR.

THE AMERICAN JOURNAL OF OTOTOLOGY.

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Original Communications.

COMPARATIVE MORPHOLOGY OF THE EAR.

FOURTH ARTICLE.

By CHARLES SEDGWICK MINOT,
BOSTON, MASS.

It is generally believed by entomologists that insects can hear. Indeed, the sounds produced by many species appear to be sexual calls, by which the males endeavor to attract the opposite sex, which must therefore hear. All attempts, however, to demonstrate the existence of an auditory organ in insects have hitherto failed. The only organs which might be interpreted as answering functionally to an ear are the so-called tympanal organs of Orthoptera, but it has never been demonstrated that these peculiar structures do really subserve the sense of hearing. Nevertheless they are commonly considered to do so, and in accordance with the prevalent view, which I am by no means prepared to accept, it will be appropriate to give an account of the organs in question.

8. THE TYMPANAL ORGANS OF ORTHOPTERA, AND ALLIED STRUCTURES IN OTHER INSECTS.

The so-called tympanal organs of grasshoppers and crickets were known to entomologists in the early part of this century, for they are mentioned in the manuals of entomology by Burmeister, and by Kirby and Spence. The singular structures connected with them were first discovered by Johannes Müller (VII.), and were subse-

quently investigated with great skill and success by his distinguished pupil, C. Th. von Siebold (IX.). Since then our knowledge has been enlarged by contributions from Leydig (IV., V., and VI.), Hensen (III.), and Oscar Schmidt (VIII.). More recently still Graber has published an elaborate monograph (II.) with ten quarto plates. This last memoir is very valuable, and although the histological part leaves much to be desired, it may fairly be termed exhaustive in its general treatment. It is, however, marred by prolixity so extreme that the memoir could easily have been reduced to one third, and might, possibly, have been reduced to one sixth, of its present dimensions without omitting any of the results. A considerable proportion of the unnecessary part of the text consists of descriptions of the mistakes made by the author, and diffuse explanations of how he fell into them. It is not an uncommon error to report the accidents as well as the results of a research, although they are due only to personal causes, and, therefore, not obstacles to be pointed out to others. This criticism may be applied quite generally to German scientific writings, which are notoriously so often defective in form and style that it is time to blame them and demand improvement, since it is, perhaps, not too much to say that there is no nation whose contributions to science are so badly written as the German.

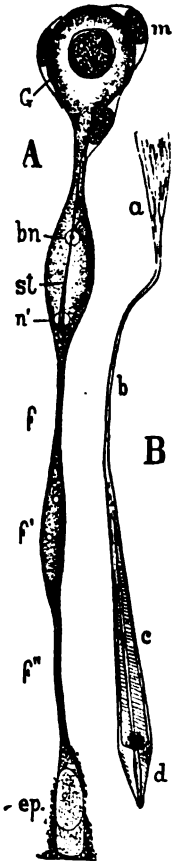


FIG. 21. *Locusta viridissima*. A, terminal body of the supratympanal organ. G, ganglion cell, and its membrane, m; bn, basal nucleus; st, rod; n', top nucleus; f, f', f'' peripheral fibre; ep, epidermal cell.

B, isolated rod; a, its commencement; b, thread; c, body; d, head. After Graber.

The essential parts of the structures we are to consider are the peculiar terminal organs, which end the nerve fibres of the structures. Each of the terminations in question is an elongated continuation of the nerve fibre, consisting of three parts: 1, a proximal ganglion cell; 2, a middle swelling containing a stiff rod; 3, a distal fibre running to an epidermis cell. The fibre is apparently wanting in certain cases, there being then no connection with

epidermis. These divisions of the organ are shown in Fig. 21, A, which represents one of the nerve terminations, taken from the supratympanal cluster in the foreleg of the katydid, *Locusta viridis-sima*. *G* is the ganglion cell, with large round nucleus; it is enclosed in a special cellular sheath *m*; the connection of the ganglion cell with the nerve fibre is not shown, but in other views the two poles would both be seen, one uniting with the nerve, the other extending, as in the figure, to make the middle enlargement, containing the rod (*Stift*), *st*, and usually two nuclei, *bn* and *n'*, but in some species the nucleus *bn*, nearest the ganglion cell, is wanting; the peripheral fibre, *f*, *f'*, *f''*, is quite long, a little thickened in the middle, and united by its outer end with the basal process of an epidermal cell, *ep*, which last is, of course, part of the skin of the leg. The rod, *st*, extends throughout the entire length of the middle enlargement; a rod, more highly magnified, is shown in Fig. 21, B, — it begins towards the ganglion cell in a manner not clearly determined, but quickly appears as a distinct thread, *b*, which passes into a conical thicker portion, *c*, to finally end off in a head, *d*, which is pointed like an inverted pyramid.

With a single exception, which will be described immediately, the type of terminal organ just presented to the reader is characteristic of the Orthoptera, and reoccurs, as far as the observations at present avail for forming a judgment, with no important modifications in other orders of insects. Unfortunately the range of variation is reserved through our present ignorance for future determination.

The only departure from the described type that can now be presented occurs in the terminal organs which lie upon the wall of the trachea or air tube in the leg of the katydids (*Locustina*), see Fig. 22, representing a section through

the wall of the trachea; *m'* is a membrane forming part of the wall of the trachea; *n'* is distal nervous fibre running from the ganglion cell, not included in the drawing;

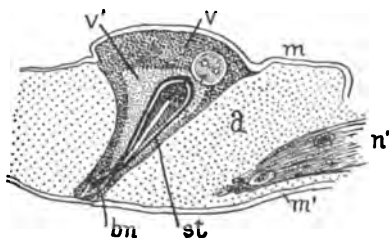


FIG. 22. Transverse section of Siebold's or the intra-tympanal organ of *Locusta*. *bn*, basal nucleus; *st*, rod; *m'*, membrane of trachea; *n'*, fibre from ganglion; *m*, Deckmembran; *v*, outer, *v'*, inner vesicle. After Graber.

the connection of the ganglion pole, n' , with the rod vesicle is wanting in this section, but can be seen in Fig. 26. The vesicle is placed nearly at right angles with the fibre, and is triangular in outline, the apex pointing downwards and uniting with the fibre. The rod, st , is much shorter and thicker than in the other form, and is surrounded by a clearer space, v' , like an inner vesicle, which again is bounded by a darker part or outer vesicle, v ; the latter bears the small basal nucleus, bn , and a larger round nucleus with two nucleoli in the upper part. The whole is covered by a membrane, to which we shall recur. What fills the space, a , around the terminal organ is not satisfactorily determined. Especially noteworthy is the absence of any distal continuation of the rod-bearing vesicle.

According to Graber's descriptions the entire "*Endorgan*" is a continuous protoplasmatic mass with multiple nuclei. Now one adequately familiar with histology cannot regard this as probable, but must consider that each nucleus belongs to a distinct cell, and that the apparent absence of discrete cell boundaries is to be attributed to the imperfection of Graber's observations. Hensen states that each rod is surrounded by four cells, a *Deckzelle*, two *Seitenzellen*, and a *Basalzelle*, but his description seems to me not consistent with itself throughout.

These rod-bearing terminal organs have not been found in any of the Arachnida or Myriapoda, but only in the true or six-footed insects. They have been observed in *Orthoptera*, *Coleoptera*, *Diptera*, and *Lepidoptera*. They are usually situated in or near the thorax or in the appendages thereof, forming in each species two symmetrical groups. Concerning their occurrence in any order except the Orthoptera, we possess, however, only extremely fragmentary observations.

They are placed in the base of the hind wings among *Coleoptera* and *Diptera*¹ (Leydig), and the spot occupied by them is indicated by certain modifications of the overlying epidermis. This spot had been observed in *Diptera*, but falsely described by Hicks.² It is

¹ In the *Diptera* the hind wings are rudimentary, and are termed *halteres*.

² Hicks, J. B.: Proc. Linn. Soc. Zool., I., 1857, and Trans. Linn. Soc., London, XXII., 1857.

characterized by wide pore-canal through the cuticula, closed externally by a thin membrane bearing a tiny hair or wart. Probably there is a special cell under each pore, and each cell connected with a rod-bearing terminal organ, since there appears to be a rod corresponding to each pore-canal. The whole structure is underlaid by a dilatation of an air-tube (trachea). Leydig gives (IV., 299-310) a few details, but we miss minuter and more extended accounts. It is interesting to see that these terminal organs may occur without any tympanum-like modification of the epidermis, so that here there is nothing to suggest that they have an auditory function.

Concerning *Lepidoptera* we possess only fragmentary observations. A. H. Swinton claims to have found a distinct tympanal organ in first abdominal segment of several moths, but his description employs a very antiquated terminology, which is a little confusing. There is on the side of the anterior and constricted portion of the first abdominal segment a smooth oval membrane, which appears to be homologous with the tympanum of the Acridians, which we shall describe presently. The adjacent interior of the segment is occupied by very complicated air-cells. A spiracle lies *behind* the membrane (not in front as in the grasshoppers). A nerve passes from the third thoracic ganglion "obliquely across and round the elevator muscle of the hind wing" to the supposed tympanum, where it is connected with a structure (Swinton's "membranous vesicle"), which is apparently identical with the structure in like position in the grasshoppers, which latter was likewise originally described as a vesicle, but is now known to be really a cluster of rod-bearing terminal organs. Underneath this structure is a thickening of the cuticula, as in Orthopterous forms. It is probable that this organ in moths is entirely homologous with that of the Acridians, but the matter must remain uncertain until the terminal rods have been found on the Lepidopterous tympanum.

Among *Orthoptera* they appear in two distinct localities, namely in the grasshoppers on the side of the first abdominal segment, in the crickets (*Gryllodea*) and katydids (*Locustina*) in the upper part of the third joint or tibia of the fore legs. In both cases the surrounding parts have undergone modifications, which, in conjunc-

tion with the terminal bodies proper, make the so-called tympanal organs.

We begin with the organ of grasshoppers. It consists of three parts; the tympanum proper, which is a modified portion of the integument; the cluster of rod-bearing organs; and, finally, a vesicular enlargement of the underlying trachea.

The tympanum lies upon the side of the first segment of the abdomen, immediately behind the spiracle (Fig. 23). It is oval in outline,

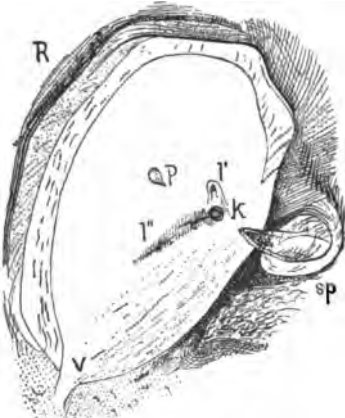


FIG. 23. *Caloptenus spretus*, tympanal cuticula. R, ring; sp, spiracle; p, pear-shaped body; l, k, l', *zweischenkeliges Körperchen*.

but sometimes presents a hilus upon the side towards the spiracle, thus becoming reniform, as in *Rhomalea*. Its outer surface is glistening and much smoother than the surrounding skin or crust. Its lower and anterior quarter is slightly roughened, usually by furrows, which run obliquely downwards and backwards; this quarter also carries hairs in a few species. The crust around its margin forms a thickened ring, which projects on the inner surface, and is not continuous,

but interrupted at the lower edge of the tympanum (Fig. 23, V). — The tympanum may lie nearly on a level with the surface of the body, or be sunken below it; in the latter case the marginal ring becomes more prominent and complicated, especially by the development of folds, which, in a certain series of forms (Graber, II., 85–87), increase more and more until they cover over most of the tympanum (e. g., *Stenobothrus*, *Pachytylus*). The cuticula of the tympanum is thinner than that of the unmodified epidermis, and offers two specialized parts for consideration. The largest (Fig. 23, l' l'') is termed the "*zweischenkeliges Körperchen*" (two-shanked corpuscle), and lies nearest the spiracle, sp. It has three components: the central body, k, and the two legs, l' l''. The central portion projects inwards, and is really an invagination of the cuticula, for it is a hollow knob opening directly to the outside by a fine canal. The upper leg, l', is a rod-like thickening of the inner

surface of the cuticula ; its upper end broadens and thins out, while its lower end forks to embrace the central body. The lower leg, *l''*, runs obliquely backwards, and is formed by two ridges with a shallow furrow between, the posterior ridge being much higher than the anterior ; the cuticula over the furrow bulges out a little, but is not much thickened. The second part, the pear-shaped body (Fig. 28, *p*), is usually present, and lies near the centre of the tympanum. The small end of the pear points inwards towards the ganglion tympani. This body is a thickening of the cuticula, and is traversed by fine pores. Its total absence in some forms (*Rhopalonema* and *Tropidarcis*) indicates that it is not a necessary part of the tympanal apparatus. The epidermis under the cuticula of the drum is composed of a single layer of thin, polygonal cells with large, clear nuclei. Leydig wrongly asserted that the cells extended over a part only of the tympanum. The cells contain pigment under the front part and under both the thickened portions of the cuticula of the drum.

The tympanum is wanting in the Proscopidæ, Mastacidæ, Tryxalidæ, and Tettigidæ.

Graber describes under the name of *Tensor tympani* a flat bundle of twenty or more muscular primitive fibres, which arise from an inner process of the crust just below the stigma in front of the tympanum, and run downwards.

We pass to the terminal organs proper. The epidermal cells under the "*zweischenkeliges Körperchen*" and the pear-shaped body (Fig. 23) are, mostly, if not all, prolonged at their bases into a tapering process, which unites with an *Endorgan*, as before described. (Fig. 21.) These bodies all extend towards the mass of ganglion cells placed over the "*zweischenkeliges Körperchen*," and from this passes off the nerve to its origin in the third thoracic ganglion. The result of the arrangement described is that the cluster of parts presents the following appearance when viewed from the inner surface, after the removal of the tracheal vesicle ; the nerve, Fig. 24, *N*, ascends towards central body, Fig. 23, *k*, before reaching which it expands into the ganglion Fig. 24, *G*, which is enclosed in a pig-

mented envelope, and is divided into a larger upper part and a smaller inferior portion. The main mass of the terminal organs, *T*, appear as the direct continuation of the ganglion, and form with it a pyramidal body, the apex towards the nerve; the base of the pyramid has two extensions, one, *p*, consisting in all the species that have been examined of seven terminal organs, running out to the pear-shaped body; the second, *s*, ascending along the vertical shank of the “*zweischenkeliges Körperchen*.” The smaller division of the pyramid contains the *Endorgans*, *f*, which spread out along and down the inferior furrowed extension of the “*Körperchen*.” Of course those rod-bearing structures which occupy the periphery and the extensions of the pyramid are longer than those in the centre. In form these *Endorgans* differ but slightly from the type shown in Fig. 21.

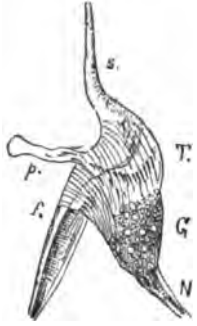


FIG. 24. *Pachytiglus striatulus*, tympanal *Endorgan* isolated. *N*, nerve; *G*, ganglion; *T*, terminal organs; *p*, terminal organs of pear-shaped body; *s*, of vertical shank; *f*, of lower shank. After Graber.

Two tracheal vesicles, or air sacks, lie on each side under the tympanum, and are developed from branches of the trachea arising from the tympanal stigma. As far as known they have no special connection either with the tympanum or the terminal organs.

We turn now to the study of the tibial tympani of locusts and crickets, which are found, as above stated, in the upper part of the third joint of the fore legs. If we imagine the leg stretched out horizontally at right angles to the body, the upper side would be that termed the hæmal, the lower the neural, and we should also distinguish the anterior and posterior surfaces.

If the fore-tibia of a green locust or katydid be examined, there will be found on the upper surface near the end towards the body two narrow slits, Fig. 25, *a*; a transverse section through them is represented in Fig. 26. The slits are seen to lead into narrow fissures; the outer walls formed by mere flaps, *a* and *b*, the inner walls being two membranes; the anterior, *ty*, and posterior, *ty'*, tympana. The space between the two tympani is occupied by two large air-sacks or tracheal vesicles, one anterior, *Tr. a*, the other posterior,

Tr. p. The vesicles divide the lower part of the section from the upper; the former contains several muscles, *m* 1, *m* 2, *m* 3, nerves, *n* and *n'*, a tendon, *s*, and other tissues. The upper part contains principally connective tissue and the terminal organs, which particularly concern us. They, *so*, lie against the wall of the anterior trachea, forming a 2. row along the upper surface of the air-tube, each with its accompanying ganglion cell, *sg*. An enlarged section of these terminal organs has been already described and figured (Fig. 22). If the anterior trachea be isolated and viewed from the hæmal side, it presents the appearance of

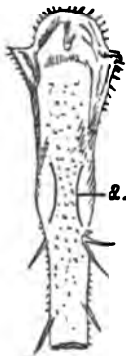


FIG. 26. *Locusta viridissima*. Tibia of fore-leg. *a*, slits leading into the tympanal fissures. After Graber.

Fig. 27. The nerve, *N*, runs along, expanding to a ganglion just before reaching the level of the external tympanal fissures, which are connected with a special cluster, the supratympanal of terminal organs, *st*. The nerve then continues along the anterior edge of the trachea, forming the elongated Siebold's ganglion, *sg*, each cell giving off an oblique fibre, *n'*, which goes to one of the *Endorgans*, *S*, as previously described. These last make the so-called Siebold's or intra-tympanal organ, which begins with a cluster of rod structures, *S'*, and is continued as a single row of terminal organs, which grow smaller and smaller until at the distal end they are very minute. The intra-tympanal organs are found only in the Locustinæ.

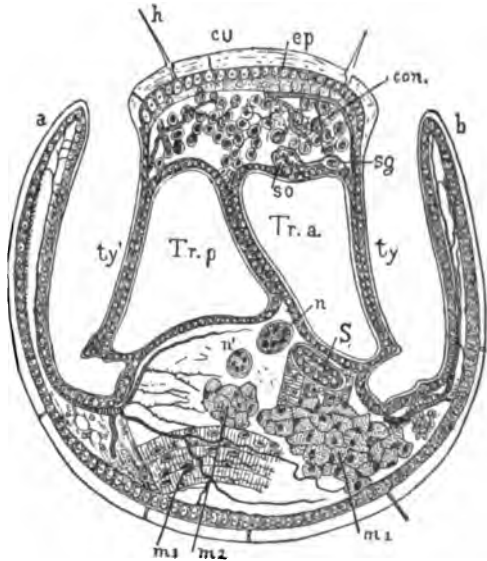


FIG. 28. *Locusta viridissima*. Section of tympanal region of fore-leg. *h*, hair; *cu*, cuticula; *ep*, epidermis; *conn.*, connective tissue; *sg*, Siebold's ganglion; *so*, Siebold's terminal organ; *a*, *b*, tympanal cover; *ty*, anterior, — *ty'*, posterior tympanum; *Tr. a.*, anterior, — *Tr. p.*, posterior air-sack; *n*, *n'*, nerves; *S*, tendon; *m* 1, *m* 2, *m* 3, muscles. After Graber.

A section (Fig. 28) through one fork of the supratympanal organs

(*st* of Fig. 27) shows their different arrangement. The supratympanal organs occur in both locusts and crickets; the actual figure is from a cricket. The ganglion, *gl*, is spread out underneath the epi-

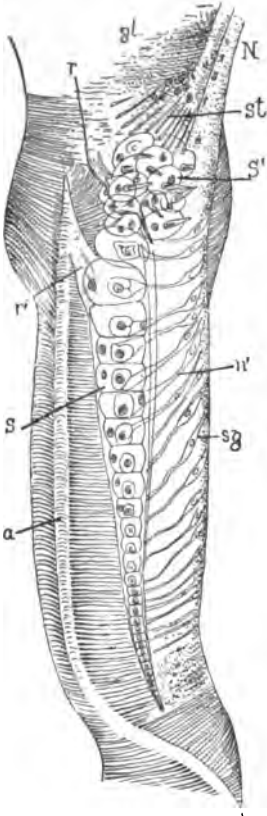


FIG. 27. *Ephippigera vitium*. View of outer or hæmal surface of anterior trachea of fore-leg, to show Siebold's Endorgan. *gl*, supratympanal ganglion; *N*, nerve; *st*, supratympanal terminal rods; *S'*, *S*, Siebold's organ; *n'*, distal thread from cell of Siebold's ganglion, *sg*; *a*, ridge on trachea; *r*, *r'*, roots of the covering membrane. After Graher.

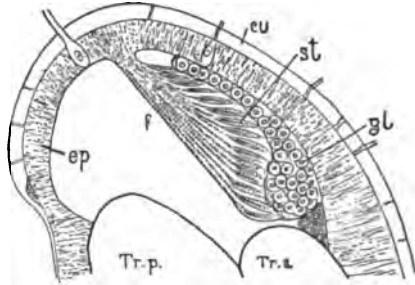


FIG. 28. *Gryllus campestris*. Section of epidermal branch of supratympanal organ. *ep*, epidermis; *cu*, cuticula; *st*, terminal organs, with their distal thread, *f*; *gl*, ganglion.

dermis, on the hæmal side (*i. e.* above, when the leg is horizontal) of the anterior trachea, *Tr. a*. From the ganglion spring the rod-bearing bodies, *st*, each of which gives off a thread, *f*, which runs across and unites with a basal process of an epidermal cell. In the figure only the general fusion of the threads and epidermis is shown. The peculiar disposition of the threads, by which their length is varied like the wires in a piano, can be best understood from the figure. Fig. 21 represents an isolated supratympanal terminal organ.

To complete our description we have to add certain details and an account of the variations occurring in different species.

The folds which cover the tympana are secondary structures, which are wanting in young katydids. They are often absent, or again one cover and not the other is developed. Species of the same genus vary in this respect. Around the tympanum the cuticula is thickened to form a complete or nearly complete ring, and over the tympana the cutic-

ula is thin with few pores and hairs, and a finely sculptured external surface. In all Gryllacridæ and some Stenopelmatidæ the tympana are wanting, but in all other Locustinæ both are present; among the Gryllidæ, all the chirping forms have a tympanum, but the mute forms do not; in some species the two tympana are unlike in structure, and often one tympanum is rudimentary, or altogether wanting, as in *Gryllotalpa* the posterior, in *Platydictylus*, *Gryllus*, etc., the anterior. Most species of crickets have a large posterior and small anterior tympanum. The terminal organs are present when the young insect is hatched from the egg, but the tympana are not well marked until after three or four moults, and the covering flaps are developed still later in the Locustinæ; in crickets the development is even more retarded. The development of the tracheal vesicles follows that of the tympana, both in time and extent, so that when the tympanum is small the adjacent vesicle is small, and when the former is wanting the latter is also.

The supratympanal ganglion and organ is really bipartite, and the account given above refers in fact only to that branch, the anterior and larger, which lies under the epidermis. (Fig. 28.) The other part extends transversely over the wall of the anterior trachea, but has not yet been carefully studied.

The supratympanal organ exhibits the following features requiring mention. The rods (Fig. 21, B) consist of a thread, a gradually thickening body, and a pointed head. The head and body are said to be traversed by a central canal into which extends the thread; the rods consist of homogeneous core and a more highly refractile envelope, with four ridges projecting inwards; in transverse section the rods present a rounded circumference. The entire organ is covered by a thin membrane, stated to be an extension of the neurilemma and of the basement membrane of the epidermis.

Siebold's, or the intratympanal, organ, which it will be remembered is found only in the Locustinæ, and in none of the order of crickets, is especially characterized by the modified form of the rods, the absence of threads connecting with the epidermis, the peculiar arrangement of the terminal structures, and the regularly progressing diminution of size towards the distal end. The ganglion cells are

very easily seen to be bipolar, their distal pole being a quite long thread. The number of terminal organs in the straight row (Hensen's *crista acustica*) is at least thirty-three in *Locusta* and twenty-eight in *Ephippigera*. The top-shaped rods are round and not quadrilateral as supposed by Leydig; they have a central canal and thread, and Graber asserts that their lower pointed end is united with the axis-cylinder from the ganglion cell. The basal nucleus of the terminal organ (Fig. 22, *bn*), resembles a nerve nucleus. The superior nucleus (Fig. 22) is much larger, spherical, and has two evident nucleoli; in *Locusta* there are two of them, in other genera only one.

A few additional details, but nothing, so far as I am aware, of great importance, has been omitted. The preceding accounts show that we have to do with unquestionable sense organs, although of a very unusual character. The nerve fibre ends in a ganglion cell, which is connected with a multicellular organ, especially characterized by the presence of a tapering rod. These singular structures are always found overlying an air sac, and in most cases (possibly all) are organically connected with epidermal cells by uniting threads. The presence of the tympana is secondary, since they are wanting in some imagos, and in the young stages of those species in which in the adult condition they are found. As to their possible function we possess no satisfactory indication; but it seems particularly improbable that they are auditory organs.

They occur very widely among insects, and it is to be expected that further investigation will show that their distribution is more general than has been hitherto usually assumed. It is certain that they are of much importance, but their physiological rôle is, we repeat, unknown.

A list of the authorities consulted is subjoined.

In the next article we shall begin with the morphology of the vertebrate ear.

AUTHORITIES.

- I. BURGER, DIONYS : *Niederl. Arch. Zool.*, III. (1876), 120.
- II. GRABER, VITUS : *Die Tympanalen Sinnesapparate der Orthopteren.*
Denkschr. Wiener Akad., XXXVL (1876), 2te Abth. 1-136. Taf. I.-X.

67011

- III. HENSEN, VICTOR : Ueber das Gehörorgan von *Locusta*.
Zeitschr. f. wiss. Zool., XVI. (1866), 190-207. Taf. X.
- IV. LEYDIG, FRANZ : Zum feineren Bau der Arthropoden.
Müller's Arch., 1855.
- V. — — — Ueber Geruchs- und Gehörorgane der Krebse und Insecten.
(Gehörorgane, p. 299-312.)
Müller's Arch., 1860, 265-314. Taf. VII.-IX.
- VI. — — — Compare also his Lehrbuch der Histologie, and his Tafeln zur
vergleichenden Anatomie.
- VII. MÜLLER, JOHANNES : Zur vergleichenden Physiologie des Gesichtsinnes,
p. 439.
8vo, Leipzig, 1826.
- VIII. SCHMIDT, OSCAR : Die Gehörorgane der Heuschrecken.
Arch. f. mikros. Anat., XI. (1875), 195-215. Taf. X.-XII.
- IX. SIEBOLD, C. Th. von : Ueber das Stimen- und Gehörorgan der Orthop-
teren.
Archiv. f. Naturges., 1844.
- X. SWINTON, A. H. On an Organ of Hearing in Insects, with special refer-
ence to the Lepidoptera.
Entomol. Month. Mag., XIV. (1877), 121-126.

ACUTE CONGESTION OF THE UPPER PORTION OF THE TYMPANIC CAVITY AND MEMBRANA TYM- PANI.

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AMONG the cases classed under the heading of acute inflammation of the middle ear, we find a certain proportion in which the advent of the symptoms, both subjective and objective, and their character, are sufficiently distinctive to justify an intimate investigation of their etiology, and an especial classification of the condition which they represent.

Leaving the general question of the causation of the condition indicated in the title lines of this paper for the present in abeyance, I desire to draw attention, for the purpose of eliciting communications on this subject from other observers, to this form of inception of acute inflammation of the middle ear.

With the increasing confidence on the part of the profession at large, and the laity as well, in the possibilities of diagnosis and treatment of diseases of the ear, it becomes more and more the good fortune of the specialist to see acute cases in their earliest stages, and to have the desirable opportunity of administering the ounce of prevention.

Observations similar to those here recorded are undoubtedly sufficiently familiar to aural surgeons, and a more accurate differentiation of the early symptoms of middle ear trouble will show that a beginning of the inflammatory process by a localized congestion, beginning in the upper portion, grossly speaking, of the tympanic cavity, as contrasted with its inception by a more general congestion of the lining of the middle ear, is by no means uncommon.

Among the distinguishing subjective symptoms may be mentioned, firstly, the character of the pain, which is usually very severe, parox-

ysmal, and makes its first appearance without, as a rule, the preceding sensations of fullness, dullness, and vague discomfort, which accompany the more general congestion of the tympanic mucous membrane, and membrana tympani. With the advent of the pain in the ear, however, there is usually a sensation of extreme tension in that organ, and, in addition to the paroxysmal pain in the ear, a constant pain, more or less acute, referred to the corresponding side of the head and extending toward the vertex. Secondly, during the first part of the attack, there is but little tinnitus aurium, and the hearing remains comparatively unimpaired.

As would be expected, also, the temperature does not rise in the earlier stage as it would in the case of a less circumscribed congestion.

Objectively, the membrana tympani is found, except for changes which have occurred as the result of previous affections of the ear, fairly transparent, but slightly congested, and evidencing no departure from its normal appearance either in color or in contour, except in the two following respects: 1. An intense congestion at its upper portion, serous exudation into the tissues in this neighborhood, and a projection outward of Shrapnell's membrane from the same cause. 2. Bulging outward of the membrana tympani as a whole, as if distended by serous accumulation in the tympanic cavity.

Paracentesis of the lower portion of the membrana tympani at this stage, and under these conditions, gives vent to air only, which escapes with a sharp hiss if the opening made is small, and allows the extended membrane to resume its normal contour.

Paracentesis of Shrapnell's membrane, or acupuncture of the swollen tissue in its vicinity, gives vent to a serous or sero-sanguinolent fluid.

The symptoms above detailed belong to the earliest stage. If the trouble progresses without spontaneous resolution, certainly within twenty-four hours, and often within three or four hours, according to the severity of the attack, the tympanic mucous membrane, as seen through the membrana tympani, is intensely congested, and an opening made in the lower quadrant, first giving vent to air, soon serves for the escape of a copious serous discharge.

It is noticeable, also, that the paroxysmal pain does not subside with paracentesis of the membrana tympani, or of Shrapnell's membrane, but continues, as a rule, until a continued copious serous discharge has in a measure relieved the tension of the distended vessels.

Of cases of this kind which have come under my observation in the primary stage, the majority have occurred in children, during measles, coincidently with the appearance or at the height of the facial eruption, and in adult males of vigorous habit after especial exposure to cold in severe weather; of the latter, several occurred when there had been exposure of the face only to a keen wind, and when there was no evidence of a condition of the naso-pharyngeal mucous membrane, which would imply extension of trouble to the middle ear.

This fact, coupled with the observation made in the cases of measles that the aural complication occurring during the facial eruption differed materially in its inceptive symptoms from the aural trouble occurring in the earlier stage of the measles, in connection with the irritation of the naso-pharyngeal mucous membrane, at least permits the inference that the acute congestion of the upper portion of the tympanic cavity in these cases is of reflex origin, the local exhibition of which is an innervation of the vaso-motor tract controlling the vessels distributed to the anterior and superior portion of the tympanic cavity from the direct tympanic branch of the carotid.

The bulging outward of the membrana tympani below, in consequence of the compression of the air in the tympanic cavity, is a symptom which may be considered as supporting this hypothesis: the tympanic branch of the carotid is distributed largely in the anterior portion of the tympanic cavity about the inner end of the Eustachian tube, and the swelling, from congestion, of the mucous membrane would both close this means of exit and, by diminishing the capacity of the tympanic cavity, compress the air within it.

That the increased intra-tympanic pneumatic pressure is an insignificant factor in the causation of pain is evidenced by the fact, that neither opening of the Eustachian tube nor paracentesis of the lower portion of the membrana tympani gives measurable relief, and that this pressure serves to control the exudation of serum is shown by the

speed with which serous exudation into the tympanic cavity follows the paracentesis in the majority of cases in which this is early done.

As would be expected, puncture of Shrapnell's membrane gives more relief than any other operative procedure. After paracentesis dry wicks of absorbent cotton should be applied and changed as often as they become moist at the outer end; beyond this the local treatment may advantageously be confined to the application of leeches and dry warmth, free leeching in a robust subject often being followed by considerable relief from pain.

Internally, the bromide of potassium would of course be indicated, and when not contra-indicated may well be given in large doses repeatedly.

ACUTE INFLAMMATION OF THE MIDDLE EAR.

BY E. EUGENE HOLT, M. D.,

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THE significance of an acute inflammation of the anatomical parts termed the middle ear, followed, or not, by a discharge from the external auditory canal, the importance of a due appreciation of the structures involved, and the pathological process going on in them, not only to the individual in whom the disease may occur, but to the physician who may be called upon for advice in such a case, makes this subject always worthy the thoughtful attention of medical men. The busy practitioner too often thinks that ear diseases are rare, simply because he is not very often called upon to treat them. The reason for this is that the laity have been taught by the profession that but little can be done for the affected ear; and whenever they have ventured to call upon the physician for advice, they generally have not received the attention, or experienced the relief, that they have in seeking treatment for other ailments of the body; therefore, there is an astonishing amount of apathy shown in regard to affections of the organ of hearing, and the suffering therefrom is almost invariably extenuated rather than exaggerated, as is often the case in affections of the eye.

We have, as yet, no statistics to show the frequency of these diseases, *per se*, or their development in connection with other diseases, except such as are afforded by special clinics. We believe, however, there could be no contribution of greater importance to practical otology than the collection of reliable general statistics of the frequency of these acute diseases, *per se*, and their development in connection with other diseases. For statistics are stubborn things, and would do much to direct attention to the frequency of these affections and to show the importance of requiring of the student a knowledge of them and of their treatment before allowing him, legally, to assume the

arduous responsibilities of the practice of medicine. It is evident from the nature of the case that the general practitioner must do the major part of the work in collecting the material for these statistics ; for it is in his practice that these acute diseases of the ear more commonly occur. The physician should, therefore, be as much interested in these diseases as the specialist, and should contribute his share to the means which is to increase a knowledge of them. In 1877 I constructed a circular, in tabular form, for the purpose of collecting statistics of the frequency with which aural affections occur in nine of the most common diseases in which the ear is likely to be involved, the record being arranged to extend over a period of six months, from November to April. The arrangement was such, and the questions so simple that to carry out the observations for the purpose of answering, did not require an otoscope or even a speculum, and yet, out of five hundred circulars sent to men who are active enough to belong to the —— Medical Society of the State in which they reside not enough of them have been returned to attain the object for which they were devised. But while my object was not gained primarily, it is believed that the circulars did a great deal of good by directing attention to the organ of hearing during the course of the several diseases mentioned in the circular. The busy senior practitioner could well be excused from making returns, although it would not have consumed over two hours of his time for each month, but for the junior members of the profession, who are fresh from the class-room and clinics, and who should institute habits of making observations and methods of recording them, there seemed to be no warrantable excuse. We believe the time is not far distant when such circulars can and will be filled from the records of the truly successful physician of the future. For the science of medicine of to-day rests its claim for the confidence of society, not upon a wise look or the giving of technical names, but upon demonstrated facts and laws of nature, gathered from researches in every department of knowledge, and, above all, upon investigations made and recorded at the bedside.

It is a self-evident fact that every chronic disease must at one time have been more or less acute in its nature, and the affections of the

organ of hearing afford no exception to this general law. Hence, the great importance of attending to the acute diseases of the ear, in order to prevent them from becoming chronic, cannot be too often reiterated or be made too prominent in any article upon this subject. All statistics of diseases of the ear teach this important lesson in a marked degree, for they show that over four fifths of all those who apply for relief are suffering from chronic diseases of the ear. This is in marked contrast with the statistics of diseases of the eye, for, while it is admitted by the highest authorities that there are nearly as many diseases of the ear as there are of the eye, statistics of the diseases of the latter organ show that over one half of those who seek relief are suffering from acute diseases.

In one thousand cases of diseases of the ear, observed and recorded in my private practice, I find that ninety-two cases are recorded as acute and sub-acute diseases of the middle ear. In classifying these diseases on an anatomico-pathological basis, there is often some difficulty in deciding to which group a given case belongs. My rule in these records has been, when a case presented recent inflammation of the middle ear, accompanied with earache, altered hearing, etc., without any visible discharge, to class it as an acute catarrh of the middle ear. When there has been a history of altered hearing with a sense of fullness in the ears, noises in the ears, and perhaps more or less pain without any visible discharge, it has been classed as sub-acute catarrh of the middle ear. Whenever the preceding symptoms occurred, accompanied by a discharge from the external auditory meatus, and the history and present condition and character of discharge did not indicate otherwise, the case has been classed as acute suppurative inflammation of the middle ear. Herewith is given a table showing the result as recorded.

It will be seen that the average age is far beyond the period of life in which "earache" is most frequent. In the acute and sub-acute catarrhal cases the oldest patient was fifty years of age and the youngest two years; while in the acute suppurative inflammation the oldest was eighty-one years and the youngest four months.

Middle Ear.	Average Age.	A. D.	A. S.	A. U.	Health.			Duration.		Result.				
					Good.	Fair.	Poor.	No. Days.	Not stated.	Cured.	Improved.	Not treated.	Died.	
20 Cases, Acute Catarrh, •														
11 Males	23	6	5	0	3	8	0	6.5	5	7	0	4	-	
9 Females	26	1	6	2	0	6	3	10.7	1	6	1	2	-	
20 Cases, Sub-acute Catarrh,														
11 Males	14	0	2	9	3	7	2	-	5	4	6	1	-	
9 Females	19	0	1	8	0	7	1	-	8	2	6	1	-	
52 Cases, Acute Suppurative Inflammation,														
23 Males	25.5	12	12	3	9	13	3	12.7	4	18	0	6	1	
29 Females	13.7	7	13	5	4	19	3	14.7	5	18	1	5	3	

In the acute and sub-acute catarrhal otitis media the cause was ascribed to a cold in all but six cases. In the acute purulent otitis media the cause was ascribed in thirty-two cases to a cold, eight to scarlet fever, three to bathing, two to typhoid fever, and one to measles, while in six cases it was recorded as doubtful. As will be seen by the table much valuable time was lost before advice was sought, since the average duration in the acute forms was from six and one half to fifteen days. In some of the cases the delay was unavoidable. As regards the result,¹ five of the acute catarrhal, and seven of the acute suppurative cases, not treated, were seen in consultation. In detailing the history, condition, treatment, and result of the cases herewith submitted, I have avoided rare and very unusual cases, and have selected those of rather common occurrence.

CASE I. was a physician's daughter, six years old, who contracted a cold and had had a severe earache, lasting two hours, for the first time in her life. The membrana tympani was highly congested. The application of one leech to the

¹ In the sub-acute catarrhal cases perhaps a majority of those reported improved were cured, but as the result was not definitely known they were recorded as "improved."

inner surface of the tragus gave immediate relief, but, in addition, subsequently quite warm water was instilled several times, and still later the ear was inflated and the hearing was restored. This was over five years ago, and there has been no recurrence of "earache," or of other unfavorable aural symptoms.

CASE II. was a lady, aged 40 ; she consulted me May 30, 1877, by request of her family physician, who said he had exhausted his resources in endeavoring to give her relief. She had taken cold two weeks previous to this time, had severe pain in both ears, soon became hard of hearing, and had very distressing subjective noises. She could hear loud conversation close to her ears and the watch when pressed against the auricles. Each drum membrane was sunken, the handle of the malleus foreshortened, short process very prominent, and the light spot absent. The Eustachian tubes were closed ; she was suffering more or less pain in the ears ; had been subject to more or less naso-pharyngeal catarrh, but never had had any ear trouble before. A four per cent. solution of argenti nitras was applied to the naso-pharynx, especially around the mouths of the Eustachian tubes, by means of the cotton-tipped probe. She was ordered bromide of potassium and a tannin gargle. On the following day the inflation of the middle ears was accomplished, accompanied by the sensation of the report of a gun ; immediately the heaviness and pressure about the head disappeared and the hearing improved. The silver was applied and the middle ears inflated at several subsequent visits ; the gargle and bromide of potassium continued, and in five weeks she was discharged from treatment with normal hearing in each ear.

CASE III. was a physician who had earache and deafness following sea bathing at Old Orchard Beach. Being totally deaf in the left ear, as a result of a fall some years before, he had taken the precaution to put cotton in the right ear to protect it, but the water entered the ear through the Eustachian tube, as is usually the case when acute otitis media is caused by bathing, and the acute symptoms of middle ear trouble quickly followed. He had got advice from Dr. Blake, of Boston, by telegraph, and had also used instillations of warm water, applied oleate of morphia, taken quinia, etc., and when seen, the height of the inflammation had subsided. The manubrial plexus and peripheral vessels were still congested, but the Eustachian tube was pervious, and he had partially recovered his hearing. He subsequently entirely recovered, but the case shows the danger to which one is subjected in sea bathing, for he had taken precautions and was on the alert to avoid the very accident which he sustained.

CASE IV. was a gentleman, aged 48, who consulted me October 4, 1880. He had taken cold two days previous, and had "earache" the following night. The pain had constantly increased until it had become almost unbearable. The lower part of the membrana tympani was quite free from congestion, but the membrana flaccida was intensely congested. The fluid extract of belladonna, quite warm, was applied to this part by means of the cotton-tipped probe. He was ordered

one leech applied to the inner surface of the tragus, and one to the concha adjacent to the meatus; a cathartic dose of the mild chloride of mercury, and the warm water douche alternating with fig poultice in the meatus. Under this treatment he considered himself well on the second day, but he had taken more cold on the fourth day and had a relapse, which was subdued by the warm water and fig poultice applied as before. In the course of three weeks, after inflating a few times, his hearing was restored to nearly its former condition.

CASE V. was a girl, aged 11, who was seen April 28, 1876. On Fast Day, eight days previous to this time, she went "May-flowering," got her feet damp, and contracted a severe cold. That night she had "earache" of sufficient severity to prevent sleep, and in the morning there was noticed a profuse discharge issuing from the left ear; at the same time the jaws became fixed so that she could open them but a very little; her head, moreover, was twisted to the right side, presenting the appearance of a well-marked "wry neck." Her treatment had been saline cathartics, ointment of camphor and lard, hot fomentations, poultices, etc. When seen she was suffering from pain shooting up through the head, the mouth could only be opened sufficiently to admit a lead pencil, and she had to take nourishment through a small tube. The ear was discharging profusely, and she could not hear the tick of a watch, that should be heard by a normal ear, a distance of at least forty-eight inches. There was a perforation three millimeters in diameter in the anterior inferior quadrant of the membrana tympani. At the moment of examination there was a thin layer of mucus covering this opening, and the respiration could be readily counted by its movement. A one per cent. solution of argenti nitras was applied to the swollen mucous membrane through the perforation by means of a cotton-tipped probe. Instructions were given to syringe the ear with a one per cent. solution of chloride of sodium, quite warm, three or more times during the day as needed, and a one per cent. solution of sulphocarbolate of zinc was ordered to be warmed and dropped into the ear twice daily. The hot fomentations to the neck were to be continued; also the rubbing and kneading with the camphor and lard ointment; while tincture of iodine was ordered to be applied lightly at night. She was seen daily, and the only additional treatment was on the third day, — syrup of the iodine of iron, ten minims three times a day. On June 8th, the tenth day of the treatment, and eighteenth of the disease, the perforation had been closed three days; the drum-head was quite clear; the light spot quite normal; and hearing for the same watch was over forty-eight inches, and considered normal for the voice. The power of movement of the jaws and the neck had been gradually recovered to a normal degree.

CASE VI. was a gentleman, 81 years old, who consulted me September 3, 1876, at the instance of his family physician. He had had, for two weeks, subjective annoying symptoms in the right ear, which had increased to more or less severe pain. The meatus was very sensitive, and the drum-head was highly congested.

It was an acute inflammation supervening upon a chronic catarrhal otitis media. He had been using warm water freely with partial relief. He was ordered two leeches applied immediately, but this was delayed too long, during which time the drum membrane had ruptured with relief to the pain and the appearance of a serous discharge from the meatus. Under the treatment of syringing, and the application of a mild astringent, — one per cent. solution of argenti nitras, — the perforation closed, and the hearing was restored to its former condition in the course of two weeks; seven visits having been made.

CASE VII. was the daughter of the physician who called me to see her February 6, 1877. She was about four years old, and was convalescing from scarlet fever of a mild type. Ten days previous to this time, after complaining of some pain in the left ear, there was noticed a discharge issuing from that ear. As there was some eruption about the auricle, her father considered the discharge to be due to inflammation of the meatus, a view too often taken by physicians, and accounting in a measure for the indifference with which they regard discharges coming from the ear. The ear had been syringed with warm water made opalescent with carbolic-acid soap. The inner part of the canal was covered with pus and mucus, upon the removal of which a perforation was seen in the anterior part of the membrana tympani; through this opening air passed by inflation. Advised to get a hard rubber ear syringe, — as the glass one which had been used did not accomplish the object, — to continue the syringing twice daily, and instill a few drops of a one per cent. solution of the sulpho-carbolate of zinc, warmed, twice daily. She was seen daily at first, when a solution of argenti nitras (one to four per cent.) was applied; then every second and third day, and the applications of the silver gradually discontinued. At the end of three weeks the perforation had closed and the drum head was assuming a normal condition, when she had measles, from the effects of which she died, without, however, having any aural symptoms.

CASE VIII. was a little girl two years old. She had but just recovered from scarlet fever, and was brought to me by her father, a physician, as soon as it was thought prudent to do so, on December 13, 1879. The ears had been syringed, and inflation had been practiced. Each meatus was found narrowed by swelling, and there was an irregular slit-like opening in the anterior inferior quadrant of each membrana tympani. The ears were syringed, as often as any discharge was seen in the meatus, with warm water and salt, and a few drops of a one per cent. solution of sulpho-carbolate of zinc was warmed and put in twice daily, while a solution of argenti nitras (from one to eight per cent.) was applied with the cotton-tipped probe. Under this treatment the perforations closed in two weeks, but she had a relapse accompanied by pain, and a great deal of constitutional disturbance. Each membrane again became ruptured, and the discharge appeared more profusely than ever. The same treatment was continued, and in about the same length of time the drum heads had healed a second time. During all this period

the hearing had been generally very poor, and had not improved. Soon after the *membrana tympani* had healed a second time there began to be a conical bulging outward in the region of the posterior fold. This continued to increase until it made a decided cone, when rupture of the membranes took place, the appearance presented being that of a conical, fleshy mass; with this appeared a profuse mucopurulent discharge. The syringing was again instituted, and under the application of *argenti nitras*, in the form of a bead, made by dipping a wire into it when melted, the granular masses were removed; the membranes healed, became clear, and, subsequently, under inflation of the ears, the hearing became normal. There has been no return of aural symptoms up to the present time.

CASE IX. was a sheriff, aged 41, who came to my office at midnight, January 16, 1879, complaining of a very severe pain in the left ear. Glancing into the ear of which he complained, by means of the mirror and reflected light, I thought for a moment that a mistake had been made, and that it must be the other ear which was affected, for nearly the whole of the *membrana tympani* was free from congestion; but, upon looking upward, Shrapnell's membrane was seen to be intensely congested. Instillation of warm water was employed for half an hour, when he experienced a decided relief. A little capsicum was placed in the centre of some cotton and the whole moistened with spirits of camphor, and placed in the meatus, — a remedy that had often relieved earache in my own case. On the following day the patient returned, saying that the cotton got out and the pain returned to the ear, and was also felt very severely in the temple, but was, after four hours, duration, instantly relieved coincidently with a loud report and the appearance of a slight discharge from the meatus. Examination showed a perforation in the *membrana flaccida*, the lower part of the drum head being as clear as on the previous night. The ear was syringed and dried carefully with absorbent cotton, and a one per cent. solution of *argenti nitras* was applied three times. The perforation closed rapidly, and the hearing, after three inflations, was apparently normal on February 6th, — twenty-one days from the first attack.

CASE X. was a physician, about thirty-four years old, who called me early on the morning of April 20, 1880. He had been somewhat out of health, and had recently been attending some cases of malignant scarlet fever. Had taken to his bed the previous day, complaining of a severe tight feeling in the left side of the head, and more or less severe pain in the ear. There was considerable prostration, and the pulse and temperature were decidedly increased. In the left ear the vessels along the malleus handle and the periphery were seen to be intensely congested, but there was no bulging of the *membrana tympani*. Warm water had been used with some relief. Four leeches were applied; two to the tragus, one to the concha, and one below the lobe. Only one of the leeches filled well, but the wounds were kept bleeding freely by the use of warm applications. Decided relief was obtained, but the pain never entirely left him, and in the afternoon it returned in all its former severity. Four more leeches were applied, and all of

them drew well. The wounds were kept bleeding freely more or less of the time for two hours, by the application of warmth to the ear in the form of cloths wrung out in hot water, and also by the use of steam. Aconite was given to keep the skin moist, and morphia to modify the severity of the pain and keep him quiet. A brisk cathartic dose of the mild chloride of mercury was administered. He had a fairly comfortable night. The leech wounds bled during most of the night, and when the clot was removed from the concha it was followed by some oozing of blood. In the mean time the bowels had moved, and his head felt less confused. After using the warm water douche inspection showed that there was a beating movement at the anterior inferior part of the drum head; this appearance, which is supposed almost invariably to indicate a perforation of the membrana tympani, was found, upon drying the parts by the cotton-tipped probe, to be due to detachment of the epithelium, and motion communicated through an intact membrana tympani by the impulse of the congested blood-vessels, the membrane not bulging in any of its parts. The hearing for ordinary conversation continued good when the right meatus was entirely closed, and this fact led the patient to suspect that the inflammation involved other structures.

Without going into details, it may be said in a general way that he had recurrence of the pain without any perceptible bulging of the drum-head, and leeches were again applied and other treatment carried out according to indications. On the third night, when I left him at ten o'clock, eighteen leeches had been applied, and the height of the inflammation seemed to have been passed. I was, however, called at three o'clock in the morning, and found him suffering intense agony. With the light of a candle I was able to see that the drum-head was bulging, and I made a free opening, making the incision in front of the malleus handle and sweeping the knife slightly downward and backward, giving vent to a muco-purulent collection from behind it and immediate relief to the pain. The ear was syringed according to the amount of discharge, and everything was progressing favorably, when, on the second day, he had more pain, the cause of which was not apparent, for there was a free opening in the drum-head. The pain increased rapidly and assumed terrific proportions, until it was suddenly relieved coincidentally with a loud explosive noise. Upon examination I found that Shrapnell's membrane had been perforated. From this time there was nothing to interrupt resolution. The discharge gradually ceased; the incision in the drum-head, as well as the perforation in the membrana flaccida, healed, and the membrane became clear, there being no scar to show where the paracentesis had been performed. The hearing power, which had been reduced to *nil* after the inflammation in the region of the membrana flaccida, was slow in returning, and was not normal until three months had elapsed, during which time he had taken the so-called alterative tonics and the inflation of the middle ear had been performed every few days.

During the acute stages of these diseases inflation of the middle ear was gener-

ally avoided; but as soon as resolution began to take place the air douche was used at each visit; the method of inflation adopted, especially in children, being a modification of Politzer's, suggested by the writer,¹ and consisting in filling the mouth tensely with air, or in blowing through the lips, as is done when blowing out a light, while at the same time the air-bag is emptied in the usual manner.

¹ Report on Otology, Transactions Maine Medical Association, 1787; Otitis Media Suppurativa, *Ibid*, 1878.

THE VALUE OF COUNTER-IRRITATION IN THE TREATMENT OF CERTAIN AFFECTIONS OF THE MIDDLE EAR.

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A SENSE of confidence that a certain drug or remedial procedure will produce a given effect, affords the practicing physician the utmost satisfaction. In the comparatively short list of aural remedies and remedial procedures there are very few in which this degree of trust may confidently be reposed, and, among these few, counter-irritation does not at the present time hold a very high rank. It is true that the older authorities — for example, Wilde and Toynbee — advocated the employment of counter-irritation in the treatment of various aural diseases, and from their day to the present time it has been the almost universal custom to apply blisters behind the ear for all sorts of aural affections. In fact, there are not a few general practitioners who make a regular practice, in all cases in which their advice is sought for the relief of deafness, tinnitus, or any other aural symptom, of first syringing the external auditory canal, and then, if that fails, of blistering the skin throughout an extensive area around the ear. They make no serious effort to ascertain the real nature of the disease, and employ these two procedures in a perfectly haphazard manner. I am disposed to believe that the frequent observation of the barren results following this practice of indiscriminate blistering, influenced many of my fellow specialists, as it did me at one time, to consider this uncomfortable therapeutic procedure as well-nigh impotent to relieve a single one of the aural affections for which it is so often used. It is also probably for the same reason that so little is said about the use of counter-irritation in almost all of the treatises on otology which have been published since the time of Toynbee and Wilde. My own experience during recent years leads me to place

a higher value upon counter-irritation than I was at one time willing to concede to it; and, from conversations which I have held with some of my colleagues, I think I am justified in saying that this opinion of the value of counter-irritation in certain forms of disease of the ear, is that held by not a few of the aural specialists of this country.

The class of cases in which I find counter-irritation particularly useful comprises all those in which the vessels of the middle ear and immediate neighborhood remain more or less gorged with blood long after the disappearance of pain in the affected region. This passive congestion of the middle ear is observed in its simplest and most easily controlled form in the later stages of an acute catarrhal inflammation of the middle ear, and is then often associated with a free exudation of serum or mucus in the tympanic cavity. It is observed in a more obstinate form in a few cases of chronic catarrhal inflammation of the middle ear, associated with, and apparently dependent upon, a high degree of congestion of the naso-pharyngeal mucous membrane. In the treatment of cases like these counter-irritation often proves of decided value. I would not go so far as to say that we can depend upon its curative efficacy alone, but would simply claim for it the power to materially enhance the good effects of the naso-pharyngeal treatment. In some cases even I have noted the fact that, despite a prolonged course of naso-pharyngeal treatment, and a systematic employment of Politzer's method of inflating the middle ears, no demonstrable diminution in the quantity of the exudation in the tympanic cavity, or in the degree of congestion of the manubrial and peripheral blood-vessels of the drum membrane, took place until after counter-irritation in the mastoid region had been practiced systematically for a longer or shorter period of time.

In infants and young children sufficient counter-irritation may usually be obtained by painting the skin over the mastoid process once or twice daily with two or three coats of the tincture of iodine. As soon as decided soreness is produced, the skin should be allowed to remain quiet for three or four days before the applications are resumed. From the progress of the case it will be an easy matter to decide how long this mode of counter-irritation should be kept up.

In adults it is also sometimes possible to produce a sufficient degree of irritation of the mastoid integuments by means of the tincture of iodine, but as a rule it is better to resort at once to the application of the ordinary Spanish fly blistering plaster or of Squibb's cantharidal collodion. I prefer the latter, and usually apply at least three or four coats to the skin behind the ear, taking the precaution—and this is an important part of the procedure—to cover well the freshly painted skin with a piece of rubber plaster. If Husband's plaster or ordinary court plaster be used instead, care must be taken to keep up slight pressure over the part for a few hours, or we may fail in our efforts to produce an actual blister. It is not necessary to apply a blister larger than one and one half inches by five eighths of an inch. It is also advisable not to apply the blistering material later than two or three o'clock in the afternoon, as from five to seven or eight hours are usually required for the formation of a well-marked collection of serum. When such a sac has formed, its contents should be evacuated, as much of the dead cuticle should be removed as may be possible, and the raw surface should be dressed with vaseline or with simple cerate. For so long a period as may be found necessary, a fresh blister should be applied on every fifth or sixth day, according to the condition of the skin behind the ear. So far as I can remember, I have never applied to one and the same mastoid region a series of more than six or seven blisters. By that time either I have found that the evidences of congestion of the middle ear had disappeared, or I have lost faith in the efficacy of the procedure to produce the desired effect.

INJURY OF THE AURICLE AND MASTOID PORTION,
FOLLOWED BY FACIAL PARALYSIS.

By CHARLES H. BURNETT, M. D.,

PHILADELPHIA.

ON November 8, 1881, John McMurray, twenty-four years old, a brakeman, was admitted to the surgical ward of the Presbyterian Hospital, Philadelphia, during the service of Dr. Thomas B. Reed. At the time of his admission he was insensible, and remained out of his mind for two weeks thereafter. There was a wound running horizontally backward from the meatus, entirely through the auricle, and communicating with a deeper wound which extended through the mastoid portion and the posterior bony wall of the auditory canal, so as to throw these two cavities into one.

Upon returning to consciousness his statement was, that on the 3d of November last, while on duty as brakeman on a freight train, he was struck behind the left ear. He could not say how or by what he was struck. He was found insensible and bleeding on top of his car, where he had fallen while putting on the brake. He thinks something might have been thrown at him, while the train was in motion, or that in putting on the brake, he leaned outward and thus struck his head against a part of a bridge, for it was a dark and foggy night, and he could not easily see what objects the train was approaching.

The sterno-cleido mastoid muscle was cut from its insertion, there was marked facial paralysis and hardness of hearing on the injured side, and there had been considerable hæmorrhage, both before and after admission to the hospital.

The writer examined the case for the first time, November 29th, in the Ear Department of the Dispensary connected with the Hospital, and found the patient very weak, with the left side of his face greatly paralyzed, and a disposition to lose his vision for a few moments upon

turning in bed, or rising suddenly. The wound in the auricle had healed beautifully under Dr. Reed's care. The auditory canal was somewhat obstructed with granulations in its deeper parts, but at the point of junction between the bony and cartilaginous parts, on the posterior wall, the canal communicated with the wound cavity in the mastoid. A movable piece of bone, spongy looking behind, but rather smooth in front, that is, towards the auditory canal, lay in this wound and was easily pushed backwards and forwards, both from the auditory canal and mastoid wound. This piece of bone was pushed so far forward into the calibre of the canal, as to hide the drum-head from view, except at its upper and anterior quadrant.

The patient could not hear words on this side, nor the tuning fork by aerial conduction, but the fork vibrating on his vertex was most distinctly heard in the wounded ear. As no perforation-whistle was ever produced, either by Valsalva's or Politzer's inflation, the diagnosis limited the disease to the outer ear and the mastoid portion.

On December 16, 1881, the aforesaid movable piece of bone became detached from the soft parts and was removed. The drum-head now became more visible, only about one third being hidden from view by a granulation on the posterior wall of the auditory canal; but no perforation in it could be detected. The hearing also improved, words being heard a foot off. The piece of removed bone was about one half inch in length and breadth, and three eighths of an inch thick, rather smooth on the surface towards the auditory canal, but evidently composed of mastoid cells, traversed by a distinct canal which resembled in calibre the facial canal. Upon holding this piece of bone in such a position as to correspond with apparently a similar part of a normal temporal bone of the left side, the canal running through it was found to correspond with a part of the facial canal, not far from the stylo-mastoid foramen. Hence the facial paralysis must be explained by the assumption that the facial canal and its nerve were severed by the blow which had penetrated the mastoid portion of temporal bone.

An ophthalmoscopic examination, made by one of the students in the ear department, — Dr. Henry Dickson Bruns, of New Orleans, — revealed on the right side a quite prominent, choked disk; the veins decidedly swollen, disk very red; the arteries diminished in size, their

coats white and glistening; an especially white patch on nasal side of disk; the right pupil considerably larger than its fellow. On the left side the same condition was found, but it had been of longer duration.

The patient's condition continued to improve, however, in every respect, excepting in the paralyzed state of his face. The hearing improved, he ceased to lose his sight upon sudden motion, and was finally dismissed January 2, 1882, at his own request, the wound in the mastoid having closed, and the calibre of the auditory canal being nearly perfect.

SALICYLATE OF CHINOLINE IN OTORRHŒA.

By CHARLES H. BURNETT, M. D.

PRELIMINARY COMMUNICATION.

CHINOLINE is a somewhat distant relation of resorcin. Its formula is C_8H_7N , and it is the first of a homologous series of eight similarly constituted alkaloids, each member of which differs from its predecessor by the addition of $C H_2$. It is a transparent, colorless, oily fluid, sparingly soluble in cold water, but more freely soluble in hot water. It mixes in all proportions with alcohol and ether. It is made from coal tar, is an energetic bacteria poison in a one fifth of one per cent. solution, and in the same proportion it prevents lactic acid fermentation. It forms several salts, among which the tartrate and salicylate are both colorless, the former occurring in the form of small acicular crystals, whilst the latter is an *amorphous powder*.¹

The latter powder is creamy white, has an aromatic odor, and is well adapted for insufflation, being far superior in this respect to resorcin. It is disinfectant, non-irritant, detergent, and quite as healing as resorcin. I have employed it pure, as a powder for insufflation, in several cases of otorrhœa, without ill effect, and apparently with good effect; but the comparatively short experience will not permit very positive assertions in the latter respect. A longer experience with resorcin shows that salicylate of chinoline compares very favorably with it in therapeutic effect, and that the latter is far superior to it as a powder for insufflation. Under the local use of each the mucous membranes are blanched quickly — most so by resorcin — and remain so for twenty-four hours, become cleaner, and cease to pour forth discharge to the extent they did before the application to them of the salicylate of chinoline.

The preparation of this salt which I have employed was made by Trommsdorf, in Erfurt, and costs at present forty cents a drachm.

¹ See article by Professor Sadtler, Amer. Journal of Pharmacy, February, 1882. page 68.

AURAL POLYPUS SNARE.

By CLARENCE J. BLAKE, M. D.,

BOSTON.

SINCE the first introduction of this substitute for the instrument of Sir William Wilde, the tubular polypus snare has been very generally adopted, and its use in many hands has naturally led to its being subjected to modifications suggested by the experience and by the personal preference of their authors, and also to its adaptation to other purposes than that for which it was originally devised, — the removal of aural polypi.

The first instrument of this kind, made, at my suggestion, by Leiter of Vienna in 1869, had a straight single tube without bridge, into which the wire loop could be entirely withdrawn, and this form of tube I have continued to use since that time as well as the bridged tube, which was subsequently made, and has been most largely sold with these instruments; this bridged tube with the flaring end was devised for the purpose of preventing a twisting of the wire loop and alteration of the plane of its incision during the process of drawing it within the tube during the operation, an advantage more than counterbalanced by the objectionable effect of the bridge in many cases of hard polypi in leaving a portion of the tumor uncut.

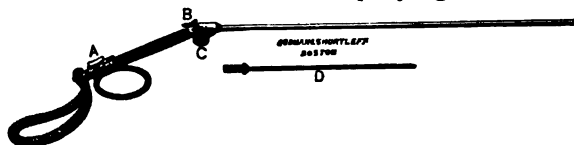
The adoption of the unbridged tube preferably by the majority of aural authorities is a sufficient confirmation of the argument in its favor made by Dr. A. H. Buck,¹ and agrees with my own experience.

The various modifications of this instrument made by different aurists for their own use have, with the exception of the very valuable adaptation of the instrument to the removal of nasal polypi, made by Dr. Arthur Hartmann, consisted chiefly in slight changes in the form of the handle and in the manner of fastening the wire, the distinctive features of the instrument remaining the same. So far as

¹ *Diagnosis and Treatment of Ear Diseases.* A. H. Buck, M. D., New York: Wm. Wood & Co. 1880. Page 253.

I am aware, no change has been proposed having in view an increase of the cutting power of the snare, and it is with the purpose of providing a means, available at will, for the better division of the tougher fibrous polypi that I have had constructed the arrangement which I now use and which is shown in the accompanying cut.

For the simple pin on the slide ring, around which both ends of the



wire were wound and fastened, is substituted a cleat, A, around which one end of the wire may be securely twisted; at B, on the side of the shaft is a similar cleat to secure the other end of the wire. When so secured it is evident that on traction on the slide ring being made, the wire loop in process of withdrawal within the tube will, instead of merely inclosing the tumor, have a distinct cutting motion which will greatly facilitate the excision of those more resistant growths, to the removal of which this form of operation is applicable. This arrangement, moreover, by no means impairs the usefulness of the instrument in the manner in which it has been usually employed, as both ends of the wire can still, when desired, be attached to the cleat on the slide ring. For the cutting purpose I have found the finest malleable wire as proposed by Dr. Buck, or a very fine silver wire, preferable.

The handle represented in this illustration has been devised to meet the objection which is sometimes made to the thumb-ring; it is removable, the thumb-ring may be substituted for it, and when desired both forms of handle will be furnished by the instrument-makers.

Removing the handle, the slide-ring, and the tube, the shaft is available, as in the original instrument, as a handle for the paracentesis needle or other knives, the cutting edges of which may be turned in any desired direction and fixed by means of the set-screw C.

In the illustration the tube for nasal polypi is represented in position, and the smaller and shorter tube for aural polypi is represented at D; this latter is made, according to Dr. Buck's suggestion, preferably of silver, in order that it may be bent to adapt it to the curve of the external auditory canal in any given case, if desired.

Book Notices.

DISEASES OF THE EAR AND THEIR TREATMENT. (*Die Krankheiten des Ohres und deren Behandlung.*) DR. ARTHUR HARTMANN, Ohrenarzt in Berlin. Kassel. 1881. 212 pp.

The first seven pages of the book are devoted to the history of the development of otology up to the first half of the present century. The ancient part of this history is especially well written, and full of interest.

Chapter I., pp. 9-44 treats of physical signs and methods of examination, describes the different instruments for this purpose, and gives illustrations of the membrana tympani in health and in some forms of disease. For cleansing the ear he advises the use of a syringe with small nozzle, bent at an obtuse angle from the syringe. For use by the patient himself, he favors the soft rubber balloons with rubber nozzle.

On p. 21, when speaking of the testing of the function of hearing, he says that, according to Knapp's proposition, the hearing distance is expressed by a fraction, the numerator of which represents the distance at which the sound is heard, the denominator that at which it should be heard. If the reviewer be not mistaken, this method of recording the hearing distance was first proposed by Dr. J. S. Prout of Brooklyn.¹

Pages 32-44, treating of catheterism of the Eustachian tube, contain the description of different methods of catheterization, and give many useful hints in regard to the diagnostic value of this method of examination.

Chapter ii., pp. 44-52, devoted to symptomatology, treats of subjective symptoms, such as tinnitus aurium, aural vertigo, hyperæsthesia acustica, paracusis, and paracusis Willisii. The tinnitus of anæmia and chlorosis the author considers as auto-perception of the "bruit du diable," induced by the flow of blood from the transverse sinus in the bulb of the jugular vein. Among the entotic noises he speaks of the faculty possessed by many persons of voluntarily producing a snapping noise in the ear simultaneously with a contraction of the palatal muscles. According to Joh. Müller, this noise is caused by a contraction of the tensor tympani muscle. Politzer attributes it to a separation of the tubal walls adherent by secretion. The author, who himself is able to produce the noises in both ears, believes it originates in the middle ear, either by a change of tension in

¹ Boston Medical and Surgical Journal, February 29, 1872.

the membrana tympani itself or by a modification of the relative position of the ossicles, caused by a contraction of the tensor tympani muscle.

Speaking of aural vertigo, the author accepts the views of Flourens and Goltz, but completely rejects the position recently assumed by Baginsky in regard to the function of the semicircular canals. He says that Baginsky's conclusions cannot apply to the human subject, for the reason that in man rupture of the membrana rotunda and pressure upon the labyrinthine contents sufficient to drive fluid through the aquæductus cochleæ into the cranial cavity do not occur; and that the minute diameter of the aquæduct precludes the possibility of any but a very slow current between the labyrinth and the cranial cavity. Until further evidence has proved the fallacy of Baginsky's conclusion, the reviewer can hardly agree with the author; for Baginsky does not contend that rupture of the membrana rotunda or such a high degree of pressure are necessary in man. By irritation of the corpus restiforme vertigo, rotation of the head, and nystagmus are produced. These are the symptoms which, according to the older observation of Flourens, Goltz, and others, are found to occur after injury to the semicircular canals. It was Baginsky's opinion that in these cases the symptoms depended upon a direct or indirect irritation of the brain caused by the manipulations necessary for the experiment, and upon repeating the experiments of Flourens and Goltz, he found that this was the case, and that in all cases where the symptoms of vertigo, nystagmus, etc., appeared, irritation of the brain was evident on post-mortem examination. It is true that in his experiments upon animals he used high pressure, and afterward found the membrana rotunda ruptured, indicating the way by which injected fluids or compressed air reached the cranial cavity; but that high pressure and rupture of the membrane were not necessary, he showed by instilling into the meatus and tympanum fluids which would exert a chemical influence. These produced only pain at first; but after they had diffused through the tissues into the cranial cavity, and had caused irritation, the usual symptoms were developed. This diffusion occupied one or more hours, and after the symptoms of vertigo, etc., were developed the fluids could be demonstrated in the cranial cavity and aquæduct by reagents.

Chapter iii., pp. 52-59, contains general therapeutics, in which great stress is justly laid upon treatment of the general system. A part of this chapter is devoted to ear-trumpets and other instruments for improving the hearing.

Chapter iv., pp. 59-64, diseases of the auricle, is preceded by a concise anatomical description, treats of eczema, perichondritis, othæmatoma, and other diseases, new formations, freezing, and wounds. The pathology of these diseases is short but clear, and the treatment is that which has proved most successful in the author's own practice.

Chapter v., pp. 64-89, contains the diseases of the meatus, preceded by a short anatomical description. In speaking of the removal of inspissated cerumen, the author favors the use of the probe when he does not succeed with the syringe.

From this advice the reviewer begs leave to dissent. The author states in his preface that he is writing especially for general practitioners and not for specialists. Now, as there are but few of the latter who will resort to instruments in such cases, notwithstanding larger experience, it would seem hardly wise to counsel their employment in the hands of the general practitioner, who might thereby be emboldened to use more dangerous instruments for the purpose, whereby serious injury can be inflicted, as every specialist has had more or less occasion to observe. In otitis externa diffusa he gives the excellent advice to desist from syringing and forcible examination of the meatus, especially in the first stage of the disease.

Chapter vi., pp. 89-100, diseases of the membrana tympani. The part treating of rupture of the membrana tympani is especially well written, also the description of the artificial membrana tympani. Of the different kinds employed the author favors the little cotton ball.

Chapter vii., pp. 100-169, diseases of the middle ear. The anatomical description is clear, especially that of the tubæ. Their physiological action is illustrated by a diagram. In acute otitis media purulenta he uses cold and heat combined in the form of warm instillations in the ear and cold applications or the ice-bag around it. No air-douche is employed while the pain is very severe. In the lighter degrees of inflammation, as in simple catarrh, and when the pain is not very intense, paracentesis should not be performed. In this respect the author is in accord with most otologists on this side of the Atlantic, who have all more or less narrowed the field of application of this operation. It seems rather strange to hear the author advise, on page 128, while treating of otitis media catarrhalis chronica, to incise the membrana tympani as an exploratory measure, which he claims can be done with impunity.

As one of the complications of otitis media purulenta chronica, he mentions sclerosis of the bony walls of the cavum tympani, and especially that of the mastoid bone. This morbid process is accompanied with intense pain. He believes that the pain is caused by the pressure of the newly-forming bony tissue upon the branch of the trigeminus which extends to the mastoid cells. The description of the complications of chronic purulent otitis media is very good, although no new points are brought forward. In speaking of the treatment of this disease he declares that he has often succeeded in effecting a cure even in phthisical cases. The author speaks highly of the application of boracic acid, as recommended by Bezold, but at the same time makes favorable mention of pulverized alum.

In order to reach the upper wall of the tympanic cavity for the purpose of making therapeutic applications, he uses an intratympanic syringe of his own construction. The canula resembles that of Blake's syringe, but in place of the hard rubber syringe, which in the latter instrument is directly connected with it, he has a soft rubber tube which closes tightly over the external end of the canula, and the syringe is inserted in the opening of this soft rubber tube. For the re-

moval of polypi he uses Blake's snare, only in place of its tube being divided in two parts by a septum, it is open.

Chapter viii., pp. 169-189, contains the diseases of the internal ear; chapter ix., pp. 189-195, the traumatic injuries to the organ of hearing, new formations, and morphological defects.

Chapter x., pp. 195-203, treats of deaf-mutism, and contains interesting statistics. On page 204 a list of instruments used in aural surgery is given.

The author states in his preface that his book is intended for general practitioners, while specialists can consult the larger works of Von Trötsch, Politzer, Urbantschitsch, and others. This plan gave him the advantage of leaving out many points which are still matters of doubt and subjects of discussion in otological literature. Perhaps this intention of writing a comparatively short work had something to do with his ignoring almost every American writer except Blake. But this consideration does not detract from its practical value. It will well repay a perusal. Its strongest point is the clearness and brevity of its differential diagnosis. The execution of the work deserves great praise. J. J. B. V.

TENTH YEAR OF OTOLOGICAL INSTRUCTION. (*X. Anno di Insegnamento della Otoratria.*) DR. E. DE ROSSI. Roma. 1881.

The total number of patients admitted was 526, of which 293 were males, 139 females, and 94 children. Two deaths.

Total number of diseases of the external ear, 98; 58 males, 26 females, 14 children.

Diseases of the middle ear, 314; 161 males, 83 females, 70 children.

Sequelæ of former middle-ear disease, 68; 44 males, 23 females, 1 child.

Aural polypus, 11; 3 males, 6 females, 2 children.

Internal ear disease, 37; 22 males, 13 females, 2 children.

Caries and necrosis of temporal bone, 15; 7 males, 4 females, 4 children.

Periostitis of the mastoid, 2; both males.

Otalgia, 1 female.

The discrepancy between the sum total of diseases and the number of patients admitted is accounted for by the fact that some patients being affected in both ears with different diseases are reported twice.

The operations performed were: trephining the mastoid, 7; extraction of sequestrum from the petrous bone, 2; extraction of sequestrum from the meatus, 2; myringotomy, 6; tenotomy of stapedius, 1; tonsillotomy, 1; puncture of sebaceous cyst, 1; removal of polypus, 5; besides numerous thermoelectric applications and artificial leeching.

Under the head of diseases of the external ear were: dermatitis circumscripta; dermatitis diffusa, acuta and chronica; dermatitis ulcerosa in patients affected with otitis media purulenta chronica; eczema acutum and chronicum; accumula-

tion of cerumen; foreign bodies; freezing; sebaceous cyst (congenital); epithelioma and syphilitic papulæ.

Under the diseases of the middle ear: myringitis; hyperæmia acuta and chronica (catarrh); otitis media purulenta acuta and chronica, desquamativa and hyperplastica. Sequelæ of former middle-ear disease are not specified in the statistical report.

Diseases of the internal ear: Ménière's disease; primary and secondary affections; caries of the os temporale and necrosis, in one case with cholesteatoma; periostitis of the mastoid; malarial otalgia.

The statistical report is preceded by a few interesting practical remarks and reports of cases, from which we extract the following: —

Although the author claims to have been one of the first to insist that in cases of mastoid disease no temporizing should take place, but an energetic plan of treatment at once adopted, he has purposely kept under observation a few cases of different forms of mastoid disease in order to test the efficacy of a milder treatment. In cases where, in consequence of otitis media purulenta chronica, or in primitive acute otitis media purulenta, the mastoid was inflamed and the integument swollen, red and painful on pressure, the usual Wilde's incision was omitted; in fact, the soft tissues were not incised at all, but the cases were admitted to the hospital and subjected to irrigation of tepid water with four per cent. boracic acid, repeated three times every twenty-four hours, for about twenty minutes. In addition to this, the skin over the mastoid was covered with mercurial ointment and extract of belladonna, p. æ., and often during the night a flaxseed poultice was applied. In all the cases where this treatment was employed the progress of the inflammation was checked. The result was satisfactory also in regard to the function of the ear, which was always improved.

This treatment seems to be applicable in the following cases: —

1. When the disease is acute.
2. When the tympanic cavity is freely accessible to continued irrigation.
3. In the desquamative forms occupying the tympanic cavity and the greater part of the meatus.
4. In lymphangitis and in periostitis, following ulcerative affections of the meatus.
5. Before the abscess becomes very painful.
6. When the skin over the apophysis is red, painful, and the œdema superficial.

These symptoms have only a relative value, and each one is strengthened by the coexistence of the others.

In some cases the general symptoms were of considerable importance. The febrile condition, the severe pains irradiating in the side of the head, the nervous excitement and insomnia, were not always contraindications to the treatment in question.

In former reports the author had occasion to refer to the great relief obtained by the application of moist heat, and he became more and more convinced that in the treatment of ear diseases the tendency had been to follow ophthalmological practice. Moist heat is a most effectual means, but experience only can teach when it should be applied. In the hands of beginners it may act as a two-edged sword, aggravating the disease rather than alleviating it. He now uses cold applications frequently and with good results.

His experience rather detracts from the advice generally given in works on ear diseases in regard to the employment of Wilde's incision or trephining the mastoid. The author believes that in a number of cases of mastoid disease there exists only a local affection of the lymphatic vessels. Whatever the real nature of the disease may be, the fact remains that some inflammatory diseases of the mastoid with pretty severe symptoms can be cured without use of the knife.

In circumscribed dermatitis the author follows the advice of Löwenberg, namely, early incision of the small tumor and the application of boracic acid in powder form.

For the treatment of diffuse dermatitis he has always successfully employed alcohol; in dry chronic dermatitis potassa caustica in solution, and sometimes white precipitate with vaseline.

The ulcerative form, which is found mostly in scrofulous children, he treats with calomel in powder, and sometimes with iodoform. In one case, where the entire therapeutical arsenal had been exhausted and the ulcer threatened to become phagedenic, he found great benefit from the continued irrigation with water and boracic acid.

Acute eczema of the external ear is left alone, or applications are made of decoction of lettuce, viola tricolor, or poppies as local tepid baths.

Chronic eczema is successfully treated with solutions of caustic potash.

For the removal of inspissated cerumen injections were used of tepid water. The same treatment applies to the removal of foreign bodies, in addition to the author's filiform hooks or his articulated forceps.

Myringitis is treated by alcohol, and the author believes this treatment to be preferable to tepid baths and myringotomy.

Acute hyperæmia of the tympanum is treated by deturgent gargles and Politzer's inflation or intra-tubal injection of muriate of ammonia.

In chronic catarrh, especially of the tubæ, the pharynx is painted with tinct. iodii or argent. nitr.; when necessary the uvula was resected and injections made into the tubæ of muriate of ammonia, sulphate of zinc, or weak solutions of argent. nitr., through the catheter.

In acute purulent otitis media he advises early paracentesis of the membrana tympani, followed by application of solutions of boracic acid or argent. nitr.

The chronic forms of this disease, when not aggravated by severe hypertrophy

or hyperplasia of the tissues, were treated in different ways, in regard to which the author comes to the following conclusions :—

1. Boracic acid is much less effective in chronic than in acute inflammation.
2. Nitr. argent., in caustic dose, does not necessarily led to irritation of the mastoid region.
3. Iodoform is an excellent remedy in children, and especially when the discharge has more of a mucous character.

Superior to either boracic acid or iodoform is the resorcin.

When the hypertrophy of the mucous membrane is considerable, he employs nitr. argent. in substantia or the galvano-cautery. Polypi are removed by his snare. The hyperplastic form of the chronic inflammation of the middle ear is treated by intratympanic injections of resolvent or irritating fluids, mostly iodide of potash or caustic potash or muriate of ammonia.

The sequelæ of different middle-ear affections gave occasion to the performing of different operations, cutting through bridges, loosening of synechiæ, etc. In one case excellent result was obtained from tenotomy of the stapedius muscle. In labyrinthine affections the author used iodide of potash internally in large doses, hypodermic injections of eserine, and artificial leeching. In some cases there was a decided improvement.

The most important cases, twenty-seven in number, received hospital treatment. Some interesting historię morbi are given; we insert a few of the most important.

Caries and necrosis of the temporal bone; mastoid abscess; opening of the abscess; trephining the mastoid; cure. — C. C., male, thirty-six years old, a laborer in the "Campagna," does not remember to have suffered from any diseases, and, though living in a malarious district, had never been affected by intermittent fever. This ear disease dates from the beginning of January, and he ascribes the cause to violently blowing of the nose, from the fact that he experienced a great noise in the ear from the passage of air during the act. Since that time the noise never ceased, and a slight purulent discharge ensued. As he did not suffer any pain he continued his work without seeking medical advice. One month after a slight swelling occurred in the mastoid region which, according to the patient's statement, was not painful, not even on strong pressure. A poultice was prescribed, and after two weeks of this application of moist heat the physician diagnosed an accumulation of pus, and advised a linear incision, which, when performed, gave issue to about half an ounce of pus. The incision closed rapidly, but the swelling did not diminish. Since that time he was obliged to give up work, because the purulent discharge from the meatus externus daily increased, and pressure upon the swollen mastoid caused a considerable increase of the same. On his admission to De Rossi's clinic there was little pain. Hearing R. E. watch ten centim. faintly, L. E. normal. Tuning-fork heard R. E. By inspection the right ear exhibits a doughy swelling of the mastoid, extending upward over a large part of the temporal squama and forward

over the zygomatic region; continuing backward to the posterior cervical region, it extends downward following the course of the jugular vein. The auricle and the skin of the tumefied part seems to be separated from the underlying bones. When seen from behind the right auricle seems to be attached about four cm. lower than the left, it is rolled backward and somewhat round its axis like paper. The exploration of the meatus is difficult on account of the enormous amount of pus; by pressure upon the mastoid it flows in larger quantity, and it can be seen oozing through a small fissure at the posterior wall of the meatus in its cartilaginous part.

In the absence of pain, either spontaneous or on pressure, or of febrile symptoms, vomiting, vertigo, or any other cerebral symptoms, the diagnosis of caries seemed hardly probable, rather that of suppurative periostitis. However, a large incision was certainly indicated. This was performed March 25th. No anæsthetic was administered. As soon as operated a considerable quantity of pus escaped, but not as much as might have been expected from such a considerable separation of the skin in suppurative periostitis. But when the bone was exposed a large opening was observed, leading into the antrum, from which numerous vegetations, covered with pus, extended. Caries of the mastoid was diagnosticated and the opening made by nature was enlarged, the cloaca was curetted, and after cleansing an antiseptic bandage was applied. Slight fever the first two days. Temperature not above 39° C. Third day no fever. May 13th leaves the Hospital.

Caries and necrosis of the mastoid in a patient already affected with chronic purulent otitis media; trephining; cure. — M. D., male, twenty-eight years old, laborer in the Campagna, has often suffered from malarial fever. He is of robust exterior, but his skin presents the yellowish color, and the hypertrophy of the spleen, usually found after long-continued malarial infection. Had an acute inflammation of the left ear, with copious discharge, at the seventh year, which ceased without treatment, but reappeared twice during the same year. Since then no trouble until two months before his admission, when, suddenly, tinnitus, incessant pain increasing during mastication, and progressive deafness appeared. After this had continued two weeks the patient observed an offensive discharge from the ear, while a distinct perforation whistle was also heard. He continued his field labor until the 9th of April, when he was suddenly attacked with severe fever, acute pain, which irradiated from the ear to the corresponding side of the head. The hearing was entirely lost; the discharge ceased, and the left auriculo-temporal region became swelled, and on April 11th he was admitted. On examination the entire periauricular region was tumefied, the auricle pressed downward, intense pain on palpation, burning heat and redness of the skin. The otoscopic examination, which was very painful, showed considerable swelling of the walls of the meatus, slight discharge, not notably increased on pressure. He was put to bed, ungt. mercurii and belladonna, and cataplasmata applied, and the ear irrigated with a boracic acid solution. In the evening fever less, tempera-

ture 37.5°C . During two days the symptoms seemed to abate, but in the night of April 13th fever, pain, and swelling increased, while the corresponding eyelids became œdematous. The next day operative interference became urgent, and as soon as the skin was incised a large quantity of pus escaped, which infiltrated the entire region around the ear. After removal of the periosteum the mastoid process proved on the touch to be affected by caries. A large opening was gouged out and the fungous vegetations which filled the antrum removed. The wound was kept open with pledgets of lint saturated with alcohol, and the auricular region covered with carbolized cotton. Left the Hospital cured June 15th, Hearing: watch on contact.

Otitis media purulenta chronica with consecutive caries of the temporal bone; sequestrum removed by American dental drill. — A. G., forty years old, gamekeeper, was admitted to the Hospital in 1875 for *ulcera syphilitica*, of which he was cured in a short time. Three weeks after he left the Hospital he was one night suddenly attacked with very acute pains in the right ear. This continued three days, when an abundant purulent discharge occurred from the ear and also through the mouth and nose. He also observed that the mastoid region began to swell, and in two months' time it had assumed a considerable size; when it was incised it gave issue to a large quantity of fetid pus, which checked the discharge from the ear, mouth, and throat. Although in the course of several months the swelling was greatly reduced the wound did not heal. The mastoid was trephined, but without benefit. Afterwards Canquoin's paste was applied without favorable effect. Being readmitted to the Hospital a large opening was made over the mastoid, and an enormous sequestrum, consisting of the entire mastoid process, was removed. The wound slowly healed with the exception of a small fistula, and the patient returned to his work. He continued this for two years, suffering during that time from repeated attacks of malarial fever.

In November, 1879, the patient was for the third time admitted to the Hospital in a most unfavorable general condition, on account of malarial cachexia, with large tumor of the spleen, hydrops ascites, and œdema of the lower extremities. While a general treatment was instituted against this condition, the fistula behind the right ear was enlarged by laminaria and sponge tents, and through the enlarged opening a number of fungous vegetations, which appeared at the bottom, were removed by galvano-cautery. Some fragments of bone came away at the same time. Notwithstanding the Lister's medication was applied, the patient was attacked with fever, the small wound reopened, and was covered with diphtheritic spots, which appeared at the same time on the posterior arches of the soft palate, which remained for some time paralyzed. But the patient overcame also this unfavorable complication and left the Hospital in April, 1880, much improved. In the next autumn he returned with an extensive and painful swelling of the lateral region of the neck and also aphonia; these symptoms diminished after dilatation of the fistula. On examination the patient presented a generally debilitated appear-

ance; the skin had a pale earthy hue; the functional examination showed that the hearing of the right ear was entirely destroyed. The otoscopic examination gave negative results in regard to the condition of the drumhead and cavity; the meatus was only pervious two cm. The left ear was in a normal condition. Back of the auricle of the right ear there was a considerable excavation, having in its centre a large funnel-shaped fistulous opening with resistant walls and covered with fungous growth. A fine forceps penetrated a distance of three cm., and then reached a cavity containing a hard, smooth, and somewhat movable body. It was impossible to extract it on account of the narrowness of the fistulous canal in its middle part. This exploration caused the patient great pain and a bloody discharge ensued. After repeated examinations it became evident that there existed another sequestrum of the temporal bone lodged in a long enclosure.

With the hope that the dura mater might be very much thickened, as often occurs in these cases, the vegetations covering the walls of the fistula were scraped off with a sharp spoon and then cauterized with a loop of red-hot platina wire. After the eschar had fallen off a sufficient dilatation of the fistula was obtained, and many vain attempts were made to remove the sequestrum. At last it was attacked with the American dental drill. After the fifth session the sequestrum broke in two parts, the smaller of which could be immediately extracted, and a few days later also the larger part came away. The latter formed an irregular sequestrum of about 20 sq. mm., 2 or 3 mm. thick, and appeared to belong to the peripheral part of the mastoid. The wound was treated with iodoform, and after two weeks the walls of the fistula were entirely covered with good and healthy granulations, promising a complete cicatrization of the small wound, when the patient was dismissed.

Otitis media purulenta chronica; mastoid abscess; periostitis of the temporal and occipital bone; trephining the mastoid; severe erysipelas.—G. N., forty-two years old, suffered from disease of the right ear since the age of four and a half months. Has had a discharge from the same ear several times. This would last a few days and disappear without treatment. He distinctly remembers five of these attacks, and says the first one occurred when he was seven or eight years old. When the present disease began he observed that the hearing of the right side was considerably impaired and pus was discharged from the ear. Severe pains came on which did not allow him to work, and after ten days these pains irradiated toward the eye of the corresponding side, and downward to the cervical region, making movements of the neck well nigh impossible. There was nightly fever, which disappeared under profuse perspiration. The fever continued for ten days and then disappeared, but all the other symptoms continued three months with more or less severity. Having suffered lately for twenty days from high fever, chills, pulsation in the ear, violent pain in the region surrounding the ear, and finally a rapid and successive swelling of the entire mastoid region, he was admitted to the Hospital May 8th.

The patient, a man of robust habitus, presented the following appearance : The right side of the head deformed by a general separation of the tissues from the underlying parts. The auricle turned forward and rolled somewhat around its axis, and forming the apex of an enormous purulent collection which separated all the tissues of the frontal, temporal, and occipital region from the underlying bone. There was distinct fluctuation. Slight purulent discharge from the ear, not increased on pressure. Tuning fork heard R. E. Watch R. E. — 0 on contact. L. E. normal. Pulse frequent.

The day after his admittance he was operated upon. A large opening was made over the mastoid and the pus entirely removed. The mastoid itself was then trephined, until the centre was reached. The entire temporal bone and the right half of the frontal and occipital bones were exposed, attacked by superficial periostitis. At the completion of the operation an antiseptic medication was applied, including large drainage tubes. Three days after the operation a severe erysipelas set in, involving the head, face, and trunk, which greatly jeopardized the patient's life. Abscesses formed in the upper eyelids, and a gangrenous spot in the inferior occipital region. When this was removed the bone was exposed. After the erysipelas ceased the eyelids healed, and drainage tubes were applied in the occipito-mastoid region. The patient had been entirely free from fever several days when, at the close of the clinical period, he was transferred to another ward.

A few more cases are reported, showing especially the treatment proposed by the author in his preliminary remarks in regard to irrigation with boracic acid solution, either cold or warm, in different cases of tympanic and mastoid disease, all well worth reading in the original. We shall conclude with the two following cases, which ended fatally.

Otitis media purulenta chronica with consecutive caries of the temporal and occipital bone and the first two cervical vertebræ. — M. P., fifty-seven, had enjoyed good health until September, 1880, when she was attacked with malarial fever. She was admitted to the Hospital, and after three weeks' sojourn there she was attacked with a severe tinnitus in the left ear, but without pain. After this symptom ceased a fluid discharge occurred from the ear, at first watery, but afterward purulent. During the month of February the patient was affected with scabies, for which she was removed to another hospital ; while there she observed that the left side of the neck began to swell, although as yet there was no pain. On the 2d of March she was again transferred, and the tumor, which had obtained a considerable size, was incised, giving issue to a large quantity of pus. The next day she came under the care of Dr. De Rossi.

The patient presented a poor and irregular bony development, noticeable especially in the bones of the skull ; the general nutrition was very poor ; she was somewhat idiotic and cried like a baby. Temperature 38.5° C. On the left side of the neck was found a hemispherical tumor, about the size of half an orange,

extending upward to a level with the auricle, downward a little below a line drawn from the lower margin of the maxilla inferior, and backward to the linea mediana of the occiput. The skin was pale and, like all the other tissues, very much infiltrated. The tumor had a doughy consistency, and showed in its postero-inferior part an incision three cm. long. When pressure was applied the patient complained of pain, and pus followed in large quantity from the incision and also from the meatus. On otoscopic examination the meatus of the left ear was found normal, both in its cartilaginous and osseous parts. From the cavum tympani arose a polypoid vegetation of the size of a bean; from the part of the tympanic cavity between this polypus and the posterior wall issued pus. The functional examination showed the lining on left side entirely destroyed.

Diagnosis : Otitis media purulenta chronica, with consecutive caries of the temporal bone.

March 2d, another operation was undertaken with the intention of opening the purulent focus which was supposed to exist in the mastoid. An incision six cm. long was made through the soft tissues of the regio temporo-mastoidea, and after removal of the periosteum the most diligent search failed to show any fistulous opening. The gouge was then inserted in the usual place, a little below and behind the sutura squamosa-mastoidea, and an opening made more than one cm. deep, without penetrating the mastoid antrum or encountering any diploetic or pneumatic cells. On account of the undeveloped condition of the mastoid, it was deemed imprudent to continue the operation. The second incision was brought in communication with the former by means of a drainage tube and Lister's anti-septic bandage was applied.

During the first days following the operation nothing occurred worth mentioning, except a slight diphtheritic appearance in the wounds, which was treated with chloride of lime. During the night of the fifth day she was taken with a violent chill, which again recurred the next day, notwithstanding the administration of two grammes sulph. quinin. After these chills the condition of the patient changed rapidly for the worse, the symptoms indicating the appearance of an additional acute purulent affection, and on the tenth day after the operation the patient died.

Autopsy. Dura mater tense, subarachnoidal oedema. The sinuses at the right side contained fluid blood, those of the left side coagulated. There was a small focus of meningitis at the lobulus of the right pneumogastric nerve. Otherwise the brain was normal.

In the cervical region of the left side, the bundle of nerves and blood-vessels was found normal. The jugular vein contained fluid blood and a recent clot. In the blood collected from different places the microscope showed myriads of micro-organisms in vivid motion. The left lateral mass of the atlas was eroded by caries at its outer edge; the articular cavity contained pus; the transverse process was carious; the vertebral artery of that side entirely obliterated. The right lateral mass

showed caries at its outer edge, and the inner surface to an extent of nearly six square mm. The transverse process slightly affected with caries; vertebral canal and contents normal.

The transverse process of the second vertebra exhibited caries at left side, right side normal. On the external surface of the temporal bone was found an artificial opening nearly one cm. square, corresponding with the opening made by the trephine. On the anterior surface of the pyramid the dura was easily detached. The entire petrous part and the sulcus sigmoideus presented a greenish-gray appearance. The tegmen tympani being opened, a thick, yellowish pus was found, filling the entire cavum tympani and infiltrating the bones. The condylus sinister of the occipital bone was affected by caries and deprived of its articular cartilage for about one third of its extent; caries was present also on the cranial surface of the condyle, extending along the anterior margin of the foramen occipitale to the right condyle. The tissues around the carotid and jugular vein were completely infiltrated with a purulent exudation.

Upon sawing through the mastoid and the cavum tympani, the bony structure was found to be infiltrated with pus, which also filled entirely the tympanic cavity and pneumatic cells. The posterior wall of the mastoid antrum communicated freely with the sigmoid sinus through a carious opening four square mm. in extent. The transverse sinus was surrounded by a purulent mass; the pus from the middle ear, and that from the mastoid, issued through the foramen lacerum posterius and joined that which formed the extensive abscess existing at the base of the skull.

Otitis media purulenta chronica (desquamative form); caries of the tegmen tympani; meningo-encephalitis suppurativa of the right temporal lobe; thrombosis of the right sinus cavernosus; death.—L. A., eighteen years old, had suffered since childhood from purulent discharge from the right ear, which occasionally would cease for some weeks and then renew without pain. The patient was affected January 6th, with severe pain in the ear, and the corresponding side of the head, accompanied with fever of a quotidian type, for which on January 9th, she was admitted to the Hospital. She had a lymphatic temperament and was affected with slight scoliosis. A fetid, sero-purulent fluid escaped from the ear. The skin of the meatus was hyperæmic; the membrana tympani showed a large perforation in its postero-superior quadrants. The chain of ossicles could not be seen, as the tympanum was filled with masses of epidermis and small fungous granulations. Tubæ not pervious. Hearing = 0. Tuning-fork on vertex was heard only at the left side. The integument of the mastoid was normal; there was no trace of œdema. No complaint of pain on pressure, but there was sensitiveness on percussion.

The treatment applied consisted in tepid irrigation with boracic-acid solutions, which in a few days caused so much improvement that it was decided to dismiss the patient from the Hospital and continue the treatment in the ambulatory clinic.

But on the evening of the 14th she was attacked with severe headache and fever. Temperature 40° C. Next day the pain had ceased and temperature was reduced to 38° C., and 0.4 grams of sulph. quin. was applied hypodermically. During the night, however, the violent pain reappeared. The hypodermic injection of quinine was repeated on the 17th and 18th. Fever continued with temperature of 40.5° to 39.5° C. At the morning visit of the 19th, slight exophthalmus and ptosis of the upper eyelid. Violent pain. Intellect normal. Caries of the tegmen tympani and suppurative encephalitis of the temporo-sphenoidal lobe was added to the diagnosis. Treatment was directed especially toward alleviation of the severe pains by hypodermic injection of morphine, and further by detergents. She had two alvine dejections on this day. Abdomen not tympanitic.

January 20th, increased œdema of the right eyelid; exophthalmos continued, pupil movable, no disturbance of the external rectus muscle. Along the course of the sternocleido-mastoid a resistant swelling was observed; pressure upon this region was very painful.

January 23d. Thrombosis of the right sinus cavernosus was added to the diagnosis. Pain on pressure along the thermo-mastoid and swelling had disappeared.

January 24th. Edema palpebrale disappeared, but the upper eyelid showed signs of ecchymosis.

January 25th. Contractions of the right angle of the mouth; pupils movable; pulse very frequent. Temperature 40.1° C.

From this day the general symptoms grew daily worse until, January 29th, the patient succumbed after a protracted coma.

Autopsy. On opening the cranium the dura mater was found firmly adherent to the bone. The brain being removed an abundant collection of pus was found in the sub-dural space, corresponding with the inferior side of the frontal and sphenoidal lobe, and the anterior margin of the right hemisphere of the cerebellum. The trigeminus, facial, and acoustic nerves were covered with pus. Convolutions of the above named lobes flattened and compressed. The dura mater at the base of the skull covered with thick, fetid pus. Sinus petrosus superior and inferior, sinus cavernosus and transversus of the right side filled with pus, and along their internal coats a tenacious, thickened deposit. No change in the foramen acousticum internum of that side. Caries was found in that part of the base of the skull which corresponds with the tegmen tympani. It extended over an area of about a centimeter, and the dura mater here was thickened and of a greenish color. Through this carious opening the pus was seen, which largely filled the tympanic cavity. The collection of pus had burrowed laterally in the sub-dural space to the entire extent of the right lobes of the cerebrum and cerebellum. Several of the large veins which open in the longitudinal sinus showed thrombosis. The sinus itself contained a thrombus, extending to its junction with the right transverse sinus, and for a little way also in the left. The cerebral substance of the left side was congested; the lateral ventriculi filled with serum; the veins of the pia

mater and plexus engorged. Meningeal folds in the right lateral ventricle filled with pus. Cerebral ganglia normal. The gray substance of the right hemisphere was pale, and corresponding with the place where the process of meningitis was most intense it presented numerous hæmorrhagic spots. On the inferior and posterior side of the frontal lobe was a small abscess in the cerebral substance, the size of a hazel-nut.

J. J. B. V.

LE FURONCLE DE L'ORKILLE ET LA FURUNCULOSE. B. LÖWENBERG. Paris: 1881. 46 pp.

The readers of this journal will all be acquainted with the communications of Löwenberg at the Congress of the British Medical Association at Cork, 1879, and that of the French Association for the Advancement of Science at Rheims, in 1880. These communications referred to otomycosis, and the idea was advanced that the germs of the vegetable parasite, which give character to this disease, are contained in the water, etc. In this monograph he gives especial attention to some of the very lowest forms of animal life as a source of disease of the ear, namely, of furunculosis of the meatus. He proposes a hypothesis explaining the probable propagation of this form of disease, and a treatment to prevent its spreading. It is a fact, that in the meatus as well as in any other part of the body, one furuncle is generally followed by others, and as the anatomical condition of the meatus makes furunculosis of this part a very painful disease, any rational treatment for abating this tendency to multiply must be welcomed. In May, 1880, Löwenberg observed a slight epidemic of furunculi of the ear. At the same time appeared a communication by Pasteur on the extension of the germ theory to the ætiology of some ordinary diseases. This communication contained the statement that the furunculi of other parts of the body contained microbia. By means of artificial culture these micro-organisms could be directly demonstrated in five persons examined.

The first cases observed by Löwenberg were already at a stage where the furuncle had opened and the matter spread throughout the meatus. The contents of the meatus exhibited innumerable micrococci of different aspect, since in each case the pus had been exposed to air, and therefore to the manifold germs which it contains, and to the various injections or instillations which had been made, the condition of nutrition and development of the micro-organisms could have been charged. The special microbe for the furuncle could therefore not be recognized.

At last a case occurred where the furuncle had not yet opened. The pus contained in the interior of the little abscess had not yet been in communication with the atmospheric air, and, in this case, when an incision was made and artificial culture applied, the identical microbe was found as Pasteur had described it in furunculi of other parts of the body. Since that time the experiment has often been repeated, and always with the same result.

Löwenberg believes that the origin of the furuncle depends upon the invasion of this special microbe, either entirely developed or in a germ state, and introduced either through air or water. The researches of Burdon-Sanderson, Pasteur, and Rindfleisch, have proved that these micro-organisms are found even in the distilled water of our laboratories, unless it be freshly prepared, and that in general water contains more of these organisms than air. This can hardly be surprising, when we consider that in abundant humidity the germs find their best conditions for development; and when we also consider that the spores, on account of their diminutive size and weight, can easily be carried away and deposited on the walls of the receiving vessels, and finally that the permanent spores resist in a measure even the temperature of boiling water, their presence in distilled water is no longer a matter of wonder.

In connection with this influence of air and water, as mediums of the germ, it is to be observed that in a large majority of cases furunculi appear in those parts of the body which are freely exposed to the air, and also come in contact with water in the daily toilet, — face, hands, and neck. Moreover, it is a fact that furunculi very often appear in patients following some particular employments, where organic substances in a state of decomposition are handled, as in the case of tanners, and this seems to prove that decomposition of certain organic substances favor the development of these micro-organisms. The same obtains of barometric pressure, dampness, direction of the wind, ozone, and electric conditions of the atmosphere. These certainly must exert some influence, especially in the epidemics of furunculosis, which are found at certain seasons of the year, for instance in spring and autumn. Löwenberg proposes in this connection the following questions: Does this change of the seasons, with sudden variations in the condition of the atmosphere, debilitate the system of certain individuals, and thus make them less resistant to the entrance of the micro-organisms? Or does the rain, which always falls in larger quantities at these periods, increase the moisture of the earth, and, coming in contact with the detritus in the soil of our cities, contaminate the water which is used for washing and drinking purposes? This might be, as it shows its influence on the development of typhoid fever and other diseases. Or do the products of putrefaction infect the air? It is quite certain that of the four seasons, the spring and autumn especially present the two conditions most favorable for putrefaction, heat, and humidity.

Whenever the special micrococcus or its germs are present in water or air, they come in contact with the cutaneous surface of our body. The epiderm and epithelium offer a great power of resistance against these invisible enemies, hence the germs need an unprotected place to facilitate their entrance within our organism.

Löwenberg believes the opening of the sebaceous follicles and of the glandulæ sudoriparæ et ceruminosæ to be this unprotected part. He uses the term pilo-sebaceous follicle, because in the thick hairs the glands constitute an appendix to

the bulb of the hair, and in the lanugo the follicle of the hair seems to be only an annex of the gland. In this way at times the orifice of the hair follicle presents, at others that of the gland. The presence of the hair seems in itself favorable to the entrance of the furuncular micrococcus, for it serves as a place of aggregation of the micrococci. In some cases the hair is covered with a layer of these little animals, and they even penetrate the hair and produce longitudinal splits. This predilection is probably due to the hygroscopicity of the hair, and also the fact that the hair is always oily from the secretion of the sebaceous glands. Another point of importance is the extended surface they present, which increases the chances for adhesion. We find a furuncle always in a pilo-sebaceous follicle, and in its centre always a hair. They appear by preference in hairy places of the skin. That they do not appear in the scalp is due, according to Löwenberg, to the thickness of the hair, which prevents the entrance of the micro-organisms in the epidermis. However, they quite frequently are found in the neck, where the hair diminishes in thickness from above downwards, and Löwenberg has also found them on bald heads. But in these cases there was not entire absence of hair; there was a quantity of moderately long downy hairs, and one of these was found in the centre of the furuncle.

Once in the fundus of the sebaceous follicle the microbe has passed beyond the zone of resistance, that is the epidermis, and is now located in the dermis, which is exceedingly vascular, and hence rich in elements of nutrition. This vascularity explains also the acute inflammation which accompanies the furuncle and the abundance of nerves explains the severe pain during the formation of these small abscesses. It is, besides, not impossible that the micrococci give origin to a particularly irritating secretion.

The meatus presents unexceptionally favorable conditions for the entrance and development of the microbia. The long and tortuous canal can hardly be dried entirely during the process of ablution; the concha and the entrance to the meatus abound in voluminous sebaceous glands, and especially at the tragus are found numerous hairs, which serve to collect the germs. In this respect wearing cotton-batting in the ear renders the entrance of the germs more difficult. If, however, they have once entered the canal, its intrinsic temperature of 35° C. is extremely favorable to their further development.

Another substance which is an obstacle to the development of the germs is glycerine, which, on account of its great hygroscopicity, excites a lively exosmosis at their expense, however, without making them absolutely sterile.

Among the causes of furuncle of the ear we often find mentioned a cold draught; this can only be explained, according to Löwenberg on the theory that a strong current of wind strikes the ear after having passed through dust laden with germs of the micro-parasites.

Furuncle of the ear occurs oftener in the female, because, although hairs are absent on the parts usually exposed to the air, they do exist in the eyebrows and

at the entrance of the meatus, and also in the nares. In the latter place furunculi appear more frequently in women than in men.

The manner of their spreading is, according to Löwenberg, auto-contagion. The germs do not develop themselves in the blood, although, of course, this fluid may become the medium by which they are deposited in other places, as Pasteur believes. But this Löwenberg doubts, and proposes the following theory of self-contagion or self-inoculation. As soon as a furuncle opens the matter contained is spread over the cutaneous surface and the special microbæ are carried into other follicles, where they give rise to a new furuncle. In this manner a number of furuncles may successively appear, and the fact that the first one of the group is almost always situated at the entrance of the meatus, and that others only subsequently appear deeper in, is in support of Löwenberg's theory. However good this theory may hold in common furuncles, yet he makes an exception in the cases where anthrax or even simple furuncles of the upper lip assume a very grave and often rapidly fatal form. Here he admits a distinct irruption of the microbæ in the blood, and he believes that the accumulation of fine drops of fat, often mentioned in the pathological anatomical accounts of these cases, may have been an accumulation of micrococci. Two observations by Reverdin and Halpryn seem to confirm Löwenberg's views in this regard.

If the constitution has been generally debilitated by some disturbance of general nutrition the development of the parasites becomes more rapid. And in this respect the alterations of the secretions of the skin may play a very important rôle. This same cause may prevail in diabetes mellitus, with which furunculosis often occurs; the disturbance of general nutrition diminishes the resistance and lowers the temperature, which usually descends to 35° C., the most favorable temperature for the development of the micrococci. Finally, he believes that the sugar itself, which is contained in all the secretions, can have some influence in the multiplication of the microbæ, who extract from the sugar the carbon necessary for their existence and development. Cohn, however, believes that in the artificial culture of the micrococci the presence of sugar is unfavorable to their development, as the more rapid and extensive development of mould acts against the formation of bacteriæ in the struggle for life.

Again, the same conditions obtain more or less during or just before the period of menstruation, which may explain the frequency of furunculosis in women during that period.

In the wake of the idea of the spreading of furunculi by self-contagion, Löwenberg goes still further in claiming that the furunculus is contagious and can be transmitted from one person to another. Three cases are reported which seem to support this theory; and, although he admits the truth of the objection, that living under the same circumstances may be the cause of the appearance of furunculi in different members of the same family, yet he thinks that the fact that they did not appear at the same time, but first in one and then in another, is in favor of his opinion.

For treatment he advises, first, the rejection of cataplasmata, which, by favoring heat and dampness, may increase the development of the germs. Incision of the furuncle followed by the application of a watery solution of boracic acid is recommended. The latter makes the basis of the treatment. As incision is always painful, it is well to apply some ether spray or bromide of ethyl. The incision should go through the top of the furuncle, which contains the hair, and be carried as much as possible in the direction of its canaliculus. The boracic acid is very poisonous to lower organisms, while it does not irritate the skin or mucous membrane. It may be employed in solution in water or alcohol: the latter is even preferable on account of its specific effects upon the micro-organisms, and as the walls of the canaliculus are more or less oily an alcoholic solution will penetrate more certainly than a watery solution. To prevent self-inoculation the furuncle and its neighborhood is covered with lint impregnated with the solution, and the utmost rigidity is observed in regard to cleansing. Boracic acid in powder form, as recommended by Von Bezold in the treatment of otorrhœa, is only used when there is still a purulent discharge, which can dissolve the acid and thus bring it in contact with the affected parts. Cauterization with red-hot iron is also recommended, especially in anthrax. This is the general treatment for furuncles, and it is also that for furuncles of the meatus, the only difference being that here the solution may be directly poured into the meatus in the quantity required, after which the meatus may be closed with a plug of cotton-batting. In some cases this application appeared at once to change the specific character of the disease, so that it became like a simple abscess. Against furunculosis, besides the local treatment of the furunculi, he advises daily ablution of the entire body with a lukewarm solution of boracic acid in water. A few cases are reported where this local and general treatment was successfully employed. The monograph ends with a consideration of the frequency of furunculi in the army, and especially among the cavalry, and Löwenberg draws from this evident frequency some support for his theory. For the crowding of people in a small inclosure favors contagion; among soldiers not the greatest care is always given to cleanliness, and among cavalry there is an additional chance of exposure in the stables.

The theory of Löwenberg in regard to the development and spreading of furunculi, however ingenious, is largely hypothetical. He admits himself that the number of cases observed is yet too small to permit him to draw definite conclusions. But he appeals not only to specialists, but also to general practitioners, who, as a rule, will meet with more cases, especially those of furunculosis, to test both his hypotheses and treatment. There are some points, however, where the author does not appear very clear or contradicts himself. On page 12 it is stated that instillation of glycerine offers an obstacle to the development of the micrococci, without, however, stopping entirely their development. This action of glycerine is based upon its hygroscopicity, which causes a profuse exosmosis from the skin; that is, deprives it of water, which is the most favorable medium for

their development. On page 27, in speaking of the relation between diabetes mellitus and furunculosis, he states that the poor conditions of general vitality favor a smaller degree of resistance to the development of the micrococci, and that sugar, not being consumed, remains in the blood, while the excessive combustion of albuminates causes agotæmia. These two causes, he says, produce an abnormal concentration of the blood, which draws moisture from the surrounding tissues and also from the skin, which becomes dry, and thus favors the development of the germs. Withdrawal of water through glycerine acts against this development; withdrawal of water through the greater degree of concentration of the blood favors it. This is decidedly a contradiction. In the three cases, by which the author tends to prove contagiousness of the furuncle, it is rather remarkable that in the first case the husband is first affected, in the other cases the wife. But in the first case the husband was under Löwenberg's treatment more than a year for chronic pharyngo-rhinitis, and in the third case it is distinctly stated that the woman was very delicate. As Löwenberg makes it a point that in the cases observed, first one person was attacked and then another, and considers this point as in favor of his theory of contagion, rather than that both were exposed to the same exterior influence, it must not escape our attention that in these two cases at least, some disturbance of the general nutrition existed, which might have favored the earlier appearance in one than in the other. In the second case the circumstances appear to be more equal; both husband and wife were healthy. The wife was attacked by a furuncle at the entrance of the right ear, which was immediately incised. Six days after a furuncle appeared at the entrance of the left meatus, and at the same time the husband showed a furuncle at the same place, and this appearance of a furuncle in both patients in symmetrically corresponding places is considered a striking argument in favor of his theory. In what manner this appearance of a furuncle in the left ear of both husband and wife is especially confirmatory of the idea of contagion we fail to see. But, as Löwenberg justly observes, only repeated researches by all interested can spread more light over these points.

J. J. B. V.

Reviews.

PHENOMENA OF BINAURAL AUDITION. Part III. SILVANUS P. THOMPSON. *Philosophical Magazine*, November, 1881.

The author has studied the case of mistuned consonances in connection with binaural audition, with the following results. The first part of the article contains some criticisms upon papers of Bosanquet, already noticed in that journal.

(a.) Two organ-pipes varied in pitch and connected, one with each ear, by rubber tubes, gave distinct beats, which ceased whenever either tube was nipped. The beats appeared to wander from ear to ear.

(b.) With a mistuned octave from pipes, beats were also heard, which consisted entirely of variations in loudness of the *lower* note. The same result was reached with forks similarly arranged.

(c.) Using a mistuned twelfth on stopped pipes or tuning-forks, the same variations in the lower note were noticed. Extreme mistuning yielded no differential tone, though such a tone was heard strongly when the two sounds were mingled together before reaching the ears. Resonators increased the loudness of the beats. The beats of the lower note are not subjective.

(d.) The mistuned double octave gave equally marked results.

The author has succeeded in producing interference between objective and subjective tones by combining the residual sensation of a note played very loudly with a real objective note tuned to beat with it. Beats were heard for about $1\frac{1}{2}$ seconds after the cessation of the loud sound.

When one ear only is fatigued, the binaural perception of direction is affected, the source of sound seeming to be more in the direction of the unfatigued ear; so far as the experiments were carried, using the simple tones of tuning-forks only the perception of the note by which the ear was fatigued seemed to be affected.

A discussion regarding certain points between Messrs. Bosanquet and Thompson will be found in the *Philosophical Magazine* for December, 1881, and January and February, 1882. C.

VIBRATORY FORMS OF CIRCULAR LIQUID SURFACES. (*Formes Vibratoires des Surfaces Liquides Circulaires.*) C. DECHARME. *Annales de Chimie et de Physique*, January, 1882. The conclusions of the author are given in the following *résumé* at the close of the article :—

Between the vibratory forms of circular liquid surfaces and soap-films of the same diameter there is a close analogy.

With the same mode of excitation and observation there is the same system of nodal lines. The measurement of the internodal distances presents difficulties of the same nature, but greater with the liquid surface, because of the smallness of these distances, which are only one sixth as great as with the soap-films. The law of the vibratory forms is the same, the breadths of the internodal spaces are inversely proportional to the number of vibrations. It is easy to produce, as with soap-films, simultaneous harmonic nodal surfaces. C.

A NEW ROUTE FOR THE EXTENSION OF MASTOID INFLAMMATION TO THE NEIGHBORING TISSUES AND THE NECESSARY TREATMENT IN THESE CASES. FR. BEZOLD. *Deutsche Med. Wochenschrift*, No. 28, 1881.

Bezold explains satisfactorily and apparently proves experimentally the pathology of some of the complications of mastoid inflammation which have undoubtedly been seen by all who have had much to do with ear disease. Reference is made to those cases where inflammation of the mastoid is followed by extensive inflammation of the tissues of the neck and by deep-seated suppuration, often ending fatally from simple exhaustion or from involvement of some of the important vessels in the neighborhood. Beginning as a purulent inflammation of the tympanum, with or without perforation, the mastoid is soon involved, tender on pressure, and showing a slight œdema, which, however, does not go into fluctuation. A decided inflammatory infiltration of the upper posterior osseous meatus is always present. After weeks or even months suddenly a new complication sets in, namely, swelling and tenderness just below the point of the mastoid at the insertion of the muscles. This swelling rapidly extends along the muscles, then forwards to the fossa retro-maxillaris and downwards along the large vessels of the neck, the swelling becoming as "hard as a board." There may be now a rupture of pus into the meatus at the junction of the cartilaginous and osseous meatus.

The swelling may cease at these limits, or may gradually extend backwards and downwards over the whole side of the neck, and finally show indistinct fluctuation at the anterior edge of the trapezius muscle. The swelling may extend upwards to the superior curved line of the occiput and far down the muscles of the neck. If rupture has occurred into the meatus, or if the mastoid cells have already been opened by operation, an upward pressure on any part of the swelling evacuates pus from these openings. Incisions in the swollen tissues only reach pus when they are made very deep. As the swelling passes backwards severe pain is complained of in the occiput.

If deep incisions and thorough drainage are used, recovery may slowly result. In many cases, however, death results from exhaustion, from involvement of the vertebræ, from œdema of the glottis, or from pus burrowing into the thorax. One case is given where there was paresis of both upper extremities, stiff neck, difficulty of swallowing, and death from œdema of the lungs.

The explanation of this series of symptoms is considered by Bezold to be an extension of the mastoid inflammation into the digastric groove either through an inflammatory perforation or through a natural porosity or dehiscence of the bone at that point, favored by the thinness of the bone and the large number of small vessels perforating it at that spot. The pus once penetrating the groove, it is prevented from showing itself externally by the digastric muscle, the broad tendon of the splenius capitis and trachelo-mastoid and by the sterno-cleido mastoid; it also is now in close contact with the occipital artery. The anterior edges of the splenius and trachelo-mastoid are connected by connective tissue with the fascia parotidea-masseterica, and backwards the tendons of the sterno-mastoid and splenius spread out like a fan and connect with the tendon of the trapezius. The pus is thus confined between the deep muscles and fasciæ of the neck, and burrows along them and along the sheaths of the vessels, especially along the occipital artery, a branch of the external carotid.

Bezold tested experimentally the course of fluids injected into these parts by boring through the mastoid into the digastric groove and then forcibly injecting colored gelatine. At first a swelling of the insertion of the muscles of the mastoid was produced, then a swelling in front and behind, which gradually extended to the fossa retromaxillaris, and then to the chin, finally the injected mass passed backwards, forming an extended swelling as far as the median line and downwards one third of the neck. Dissection then showed that the gelatine had passed along the belly of the digastric muscle under the parotid and along the sheath of the occipital artery to the carotid; the artificial infiltration was confined to the upper part of the neck. Backwards the gelatine passed along the occipital artery, and was found in three successive strata between the deep muscles, namely, between trapezius and splenius, splenius and complexus magnus, and the largest quantity of all was between the complexus, the short deeper muscles of the neck, running down even to the second dorsal vertebra.

For the treatment of such cases Bezold recommends perforating the digastric groove through the mastoid cells, entering the cells at the lower part of the mastoid process and extending the opening into the incisura mastoidea. One case is given of the disease treated in this way, which was healed in fourteen days.

THE ACTION OF QUININE AND SALICYLIC ACID ON THE EAR. (*Ueber die Einwirkung von Chinin und Salicylsäure auf das Gehörorgan.*) KIRCHNER. *Berliner Klinische Wochenschrift*, No. 49, 1881. — Kirchner has studied in the Pharmacological Institute of Würzburg the action of these two drugs upon the ear with reference to settling the still open question whether their well-known specific action (tinnitus aurium) is due to congestion of the labyrinth. Clinical observation has long since proven that they directly produce subjective noises, usually described as ringing, and also a certain, and often a very marked degree of deafness. Both of these symptoms usually pass away when the administration of the

drugs is stopped; but occasionally, when the drugs have been given in very large doses or for a long time, both symptoms continue and become a lifelong and serious affliction. Notwithstanding the fact that these clinical symptoms have been seen so often, but few anatomical observations on their causes have been made.

For his experiments Kirchner used rabbits, cats, dogs, guinea-pigs, and mice; for his clinical observations he had a garrison hospital situated in a malarial district. His conclusions are that quinine and salicylic acid produce hyperæmia of the tympanum, which may go on even to hæmorrhage, and that the whole labyrinth is likewise involved in this hyperæmia, which is often so intense that, if it continued any length of time, it must necessarily injure the ultimate nerve fibres. The cause of this hyperæmia is referred to vaso-motor disturbances, which may produce, in severe cases, a paralysis of the vessels and an exudation in the various parts of the ear, — the same conclusion which had been reached previously by Weber-Liel, Roosa, and others.

THE ACTION OF QUININE AND SALICYLIC ACID ON THE HUMAN EAR.
(*Zur Frage der Einwickungsweise von Chinin- und Salicylsäure-Preparaten auf das menschlichen Gehörorgan.*) WEBER-LIEL. *Monatschrift für Ohrenheilkunde*, No. 1, 1882.

In conjunction with Dr. Guder experiments were instituted upon twelve young and healthy medical men with the following results, one gramme of quinia muratica being given:—

1. A gradual fall in the temperature of the external meatus in the course of two and a half hours, averaging .56° C. and corresponding with the fall in temperature of the whole body.
2. No hyperæmia of the meatus or drum-membrane and no injection along the manubrium was noticed within that time or later. On the contrary, in five of the cases the slight injection which previously existed disappeared.
3. Subjective noises, as roaring, buzzing, or ringing, were always produced in from one to one and a half hours, and disappeared gradually within twelve hours.
4. After from two to three hours a decided diminution of the hearing showed itself, to disappear gradually as the subjective noises ceased.
5. In eight of the cases dizziness, usually slight but in some severe enough to cause a staggering gait, came on with the subjective noises.

The greatest loss of hearing appeared at the time when the temperature was the lowest.

Similar experiments were used in conjunction with Dr. Sachs to determine the effect of salicylic acid, the conclusions being, as follows, from taking four and a half to five grams of the salicylate of soda in two doses at an interval of fifteen minutes.

1. A diminution in temperature of the meatus averaging .35° C. within two or three hours.

2. No hyperæmia of meatus or injection along the manubrium, and where any such already existed no change whatever was noticed.

3. Roaring, singing, and occasionally ringing were felt in all cases in from two and a half to four hours, and lasted longer than similar noises produced by quinine.

4. The loss of hearing was very marked and continued in several cases for some days; in several cases where the ears were diseased the loss of hearing continued much longer, in one case, it is said, for six months.

5. Decided dizziness was noticed in seven of the twelve cases, beginning somewhat later than the subjective noises.

Comparing the second series (salicylic acid) with the first series (quinine), it was found that in the second the fall in temperature was less, but the diminution in the hearing was greater and continued longer.

A CLINICAL STUDY OF FIFTY CASES OF EAR DISEASE. JAMES L. MINOR, M. D. *Virginia Med. Monthly*, November, 1881.

Minor has collected fifty cases of ear disease at St. Joseph's Industrial Home, and of these, forty-two were girls and eight boys. Of the diseases, forty-two were chronic suppurative inflammation of the middle ear; four, impacted cerumene with chronic aural catarrh; three were chronic aural catarrh; and one, eczema of the auricle. Of the forty-two cases of otorrhœa, both ears were affected in thirty-two, making a total of seventy-four tympana in a state of chronic suppurative inflammation. The drum-heads were perforated in all instances. Twenty-nine cases were cured with restoration of hearing and an entire reproduction of the drum-heads; eleven were cured of the inflammation, and the remaining cases were in various stages of improvement.

Boric acid was the most successful agent he found in the treatment; a warm, saturated solution of boric acid was first used to thoroughly cleanse the ears; they were then dried with absorbent cotton, and the meatus about one quarter filled with finely powdered boric acid, dropped through a quill. The powder and syringing were repeated whenever the discharge was abundant. For the nasal catarrh, the nose was cleansed first with a spray of the acid and then the powdered acid was either blown or snuffed into the nostrils.

Boric acid is not an irritant to inflamed surfaces, and its action on inflamed mucous membranes and granulations may be divided into two stages: "The first gives rise to a sensation of slight warmth and moderate stimulation, and is associated with an abundant serous discharge from the succulent tissues. This gradually merges into the second stage, which is one of ease and relief, and is accompanied by a marked reduction in volume of the inflamed tissues. The diminution in size is evidently due to the depurative action of the acid on the swollen tissues during the first stage, and is especially noticeable in succulent polypoid growths with a purulent discharge (granulation). I have frequently noticed the granulations to shrink and disappear entirely under its influence, where re-

moval by the snare, and cauterization with nitrate of silver or nitric acid seemed to stimulate them to increased growth. The first stage lasts from one to six hours, and the second from six to forty-eight." G. B.

TWO CASES OF CONGENITAL MACROSTOMA, ACCOMPANIED BY MALFORMATION OF THE AURICLES AND BY THE PRESENCE OF AURICULAR APPENDAGES. JOHN H. MORGAN, F. R. C. S. *British Medical Journal*. November 12, 1881.

At the meeting of the Royal Medical and Chirurgical Society, two patients were exhibited. In one child, who was a year old, there was a fissure-like prolongation of the mouth, downwards and backwards into the left cheek and extending about three quarters of an inch, and involving all the structures of the cheek. The movements of the lower maxilla (considerably smaller than normal) were not symmetrical.

The external auditory meatus was larger outwardly and placed more anteriorly than usual and ran backwards, where it became narrow in front of the membrana tympani, which with the ossicula was believed to be natural. There were two so-called auricular appendages in a line, one below the other, on the cheek between the tragus and the extremity of the fissure; one similar growth was placed on the right cheek, and on this side the condition of the meatus was similar but less morbid. The hearing was considered good, and there was no hereditary history. There was an almost identical condition on the opposite side of the face of the second child, aged five, who was of a delicate constitution. The mouth was prolonged into the cheek on the right side of the face, and there were two similar growths on the cheek, and the external meatus of each ear was expanded outwardly. The malformation of the lower jaw, which was smaller than usual, was not so evident. The child talked naturally, and the hearing was fairly good in both ears. No history of hereditary malformation. According to Mr. Morgan's observation, the malformations of these parts were more frequent in females, and the deformity of the mouth was probably due to non-union of those parts of the first branchial arch which formed the upper and lower jaw and not to any error of formation of the oral opening, whilst, without doubt, the auricular appendages were aberrant remnants of the opercular skin-fold of the post-oral branchial cleft. In regard to operating, he did not anticipate much difficulty, but the younger child was in an unfavorable condition. G. B.

THE USE OF CONSTITUTIONAL REMEDIES IN THE TREATMENT OF EAR DISEASES. SAMUEL THEOBALD, M. D. *Medical News*, February 4, 1882.

In a paper read before the Clinical Society of Maryland, Dr. Theobald deplores the manner in which aurists of the present day neglect internal medication, and attach the principal importance to local treatment in all ear diseases.

He places mercury at the head of the list of remedial agents, and the ear affords a peculiarly favorable field for its action, when inflammation has commenced, con-

sidering its minute anatomy, composed of mucous membrane and periosteum, lining the tympanum and mastoid cells and the fibro-serous membrane of the labyrinth. He prefers the biniodide with two grains of potas. iodid. added to each grain of the biniodide, as it renders it freely soluble in water. He varies the dose from one forty-eighth to one eighth of a grain, according to the susceptibility of the patient and the nature of the malady. In deafness due to middle-ear changes he generally begins by prescribing one thirty-second to one twenty-fourth of a grain three times a day to be taken after meals : if no appreciable improvement follows its administration in these doses, together with local treatment which he never neglects, the dose is then increased to one sixteenth or one twelfth of a grain. He substitutes the bichloride when the biniodide seems to disagree, and also increases the potas. iodid. The good effects of mercury seem to be especially manifest in that form of middle-ear catarrh in which the tendency is towards sclerosis and thickening.

In specific or non-specific inflammation of the nervous apparatus of the ear, the biniodide is the most valuable remedy, and in Ménière's disease better results are obtained from this remedy than from any other, even when uncomplicated by syphilis. In acute inflammation of the middle ear, purgative doses of calomel, combined with rhubarb or rhubarb and scammony, seem to produce the happiest effects; while in those cases of middle-ear disease where the periosteum becomes affected, and there is marked constitutional disturbance with symptoms of cerebral irritation, we should bring the patient immediately under the influence of mercury (without, of course, neglecting the free application of leeches): this is best accomplished by administering, at short intervals, small doses of calomel, combined with opium, if need be, and with occasional inunctions of the oleate. The same treatment is advocated for mastoid disease as in periostitis of the tympanum.

The muriate of ammonia is recommended in ten to fifteen grain doses, in the true or secretory form of middle-ear catarrh; the pyrophosphate of soda, in doses of ten to twenty grains every two or three hours, seems to have a beneficial effect on furuncles in the auditory canal and in acute suppurative inflammation of the middle ear. As to the efficacy of calcium sulphide, as recommended by Dr. Sexton, the author has had but little experience, but when he has employed it he has found it beneficial.

This same subject of constitutional treatment in aural diseases was brought prominently before the medical profession by Dr. Sexton, in a paper published in January, 1879, in the *American Journal of Otolgy*, and recently in a paper read before the New York Academy of Medicine. He advocates the use of calcium sulphide in furuncles of the external auditory canal, and in acute suppurative inflammation of the middle ear, and even where the inflammation has extended to the mastoid cells. This preparation of sulphur, if given early, generally will prevent the rupture of the drumhead, and he seldom has to resort to the harsher method of paracentesis and trephining the mastoid.

He has discarded the use of leeches and the hot water douche, relying simply on small doses of aconite to control the pain.

G. B.

A CASE OF VICARIOUS MENSTRUATION. *Medical Press and Circular, London, February 8, 1882.*

The patient, eighteen years of age, was admitted, August 22, 1881, to St. Mary's Hospital, under the care of Mr. Field. She had had a purulent discharge from the right ear since she was six years of age, which followed a blow behind the ear. At twelve years old she became subject to pains in the back, and sick headaches; two years later she was awaked at night by epistaxis, which returned the following day and again three days later. About a month after this, hæmorrhage occurred from the right ear, which lasted an hour and was profuse; this was accompanied by a buzzing in the ear and ticking in the head, and since then she has regularly every three weeks lost blood from the same ear.

The hæmorrhage generally lasts about ten minutes, as she checks it with applications of cold water; only once has she menstruated from the vagina, and that was in 1879, when she consulted a physician who brought on the flow by a warm foot-bath and mustard, but bleeding from the ear was likewise present.

There was a large perforation in the right membrana tympani: breasts small; no os uteri could be detected by the finger, and there was a copious yellow discharge from the vagina.

G. B.

SOME CASES OF REMOVAL OF OSSEOUS TUMORS FROM THE AUDITORY CANAL. *Lancet. January 21, 1882.*

At the Harveian Society of London, Mr. Field said that in the removal of osseous tumors he was in the habit of drilling through the growth with the American dental engine, thus making a permanent opening where the exostosis was of ivory-like hardness; but in other cases of pedunculated osseous tumors, made up of soft bone, he usually removed them with stump forceps, such as are used by dentists for the upper jaw.

In all cases the patients regained hearing satisfactorily. In five of his cases the disease seemed to have been brought about by sea-bathing, and commenced as a chronic inflammation of the walls of the external meatus, and he believes that this is much more frequently the cause than gout, rheumatism, and syphilis.

G. B.

AMERICAN PRACTITIONER. Review Notice, *December, 1881.*

Löwenberg, believing that furuncle and furunculosis are due to the appearance and multiplication of a parasitic photophyte, discards the use of emollients in treatment, as he believes that the development of the parasite is favored by the heat and moisture which they induce. His plan of treatment is to lance a boil which has not already burst spontaneously, and he attempts in every case to make

a free incision, and to follow up the course of the root sheath. As the operation is a painful one, he induces first local anæsthesia by the ether spray or bromide of ether; after the incision, a saturated in the cold, aqueous solution of boracic acid is applied. He has found that when patients have refused to allow an incision to be made, a saturated solution of the salt when applied will often reduce the inflammation.

G. B.

MANOMETRO AURI. DISERTACION PRESENTADA POR EL DR. CANDELON Á LA ASOCIACION MÉDICA BONAERENSE. *Revista Medico-chirurgica, Organo de los Intereses Médicos Argentinos*. Año XVIII. October 8, 1881, No. 13.

An aural manometer, devised by Dr. Candelon, to facilitate the diagnosis of perforations of the membrana tympani. This instrument, which is nearly identical with the manometer of Politzer, consists of a U form glass tube with rubber attachment, the latter to be inserted in the meatus. A drop of fluid introduced in the glass tube naturally occupies its lowest part. If air is blown into the ear this fluid will show but a slight oscillation when the membrana tympani is intact, but a forcible movement when a perforation exists to any extent. The inventor claims for his discovery that it can be made in a very short time at the bedside of the patient. A glass tube, fourteen centimeters long, of a diameter equal to that of the meatus externus, and a rubber tube of three to four centimeters, are all that is needed. The glass tube is bent with an alcohol flame at right angles three centimeters from its extremity, and again, at a distance of one quarter centimeter from the latter place, so that the two branches thus formed run parallel, representing somewhat the form U. The rubber tube is then connected with the short arm and the instrument is ready for application. The time consumed in its preparation will be about ten minutes.

We believe that the ordinary method of detecting perforations will consume less time than is needed to make the manometer above described. J. J. B. V.

THE WISDOM TEETH AND DEAFNESS. ROBERT T. COOPER, M. D., Dublin: *Dublin Journal of Medical Sciences*, September, 1881. — Dr. Cooper reports several cases where he believes that the deafness owed its origin in each patient to a tardy or otherwise abnormal eruption of the wisdom teeth. That the teeth are often the unsuspected cause of deafness, he infers firstly, "from the intimate sympathy existing between the teeth and the ears, and the consequent very obvious prejudicial effect of infantile dentition upon these organs. And secondly, from observing the number of cases of deafness met with that date their initiation from the period of life at which these teeth appear."

In the following case, there seems to be some proof afforded that the condition of the teeth may be the veritable exciting cause of the morbid process in the ear.

H. W., aged seventeen, complained of intense earache, chiefly on left side, with otorrhœa. Five weeks previous the pain had commenced, followed after two

or three days by a discharge, and this condition had remained the same until he was first seen. The head was drawn to the left side, and the muscles of the neck became very stiff. The pain was like that of knives thrust into the ear and side of head, and both head and ear were sensitive to the least touch.

On examination the ear was very sensitive to pressure, but no inflammatory redness or swelling could be seen. Membrane extensively perforated and handle of malleus protruding into the meatus and lying against its upper wall. At first the cause of all these symptoms was attributed to bathing alone, but an examination of the teeth showed a distinct elevated hardness underneath the gums of both lower jaws, all the more noticeable on the left side as he had lost two molars from this jaw.

The symptoms began to grow worse. At night he had cold shiverings with cold feet and hands. The head became very painful, even the weight of the hair unendurable; the pain in the ear shot down into the shoulder; the head became so drawn to one side that he had to support it with his hand and he could not bear the least noise.

The patient was first seen October 11, and he continued better and worse till November 16, when a right and left wisdom tooth came through. The left gave severe pain when forcing its way through. After this all pain left the ear, and when an examination was made two days following, the discharge had ceased and the membrane had commenced to cicatrize.

Several other cases are recorded by Cooper, where there seemed to be a direct relationship between the wisdom teeth and the pain and inflammation about the ear.

The form of deafness, which dates its inception to the period when the wisdom teeth appear, cannot be distinguished from the chronic otitis, as described by Toynbee as "rigidity of the mucous membrane of the tympanum."

We must rely for the selection of a drug upon the symptoms of each case, but Politzer's inflation and catheterization of the tubes do no good, nor do blisters and intra-tympanic injections.

The object of the paper is to show the importance of examining the teeth in each case where the cause of deafness seems obscure, for if the eruption of the wisdom teeth can produce such morbid changes in the ear, a like injurious effect is presumable on behalf of carious teeth, painful stumps, or ill-fitting artificial plates.

G. B.

ON THE LYMPH-SPACES OF THE INNER EAR. HASSE: *Archiv für Ohrenheilkunde*, Vol. XVII., p. 188. — The conclusions of Hasse are thus given: "The perilymph of the inner ear flows chiefly through a membranous, perhaps endothelial-lined, ductus perilymphaticus, into the peripheric lymph-system, which also receives the liquor cerebrospinalis of the subarachnoid cavity and a small part of that from the subdural cavity, through the porus acusticus internus.

"The liquor endolymphaticus finds an exit through the arachnoid sheath of the acusticus into the subarachnoid cavity, and is probably increased by diffusion through the ductus endolymphaticus, and through its sacculus from the epi- and endo-dural serous spaces.

THE TENDENCY TO KEEP THE MOUTH OPEN IN DEAF PERSONS. GRÜBER: *Monatschrift für Ohrenheilkunde*, Vol. XV., No. 5. — The discussion in the recent Otological Congress in Milan, on the reason why many deaf persons keep the mouth open when listening, is made the subject of a critical analysis by Grüber. Various reasons have been assigned for the act. Löwenberg considered that the object was to do away with the disturbing influences of the respiratory murmurs when air passes through the nose, by transferring the air-current to the mouth; Fournié, that the improved hearing was due to an enlargement of the meatus produced by the sinking of the lower jaw; Politzer, that the movement of the jaw enlarged the Eustachian tube, and also, by some connection between the hammer and articular capsule of the jaw, increased the tension of the drum-membrane. Voltolini offered a more elaborate explanation, namely: that all the nerves and muscles are, so to say, in equilibrium in healthy persons; when one nerve-region suffers, the other region, with which the first is in equilibrium, also suffers reflexly. The facialis and trigeminus are in such a relation to the acusticus, and disease of the latter affects also the former, so that among other results we get a dropping of the jaw from affection of the nerves supplying the buccinator muscles.

After discussing these various theories quite fully, Grüber gives his conclusions as follows:—

"There is no doubt that some aural patients, suffering from strong respiratory murmurs in the nose, get relief during the act of listening, by holding the mouth open; but that these respiratory murmurs are always and alone the cause of deaf persons keeping the mouth open when listening cannot be admitted."

"The appreciable improvement in hearing from opening the mouth, in many aural patients, is to be referred to changes in the external meatus and the deeper tissues of the conducting mechanism produced by the sinking of the lower jaw."

"In some of these patients it is the resonance from the position of the mouth, either alone or in connection with still other changes in the conducting apparatus, which improves the hearing."

"The increased ease of respiration caused by opening the mouth may, in some deaf persons, contribute to the improvement of the hearing."

A CASE OF RUPTURE OF THE TYMPANUM WITH FACIAL PARALYSIS. *British Medical Journal*, 1881, Vol. I., p. 922. — At the ordinary meeting of the Aberdeen, Banff and Kincardine Branch, Dr. Booth read the report of this case. A boy, aged seven years, eleven days before being seen, fell over the stair-railing and landed on the floor below, striking on his head. He remained insensible for

some little time, and there was a slight discharge of blood from his right ear. When he regained consciousness it was noticed that the right side of the face was paralyzed. For twenty-four hours after the fall he could retain nothing on his stomach. The vomiting then ceased; all that attracted attention was the facial defect. Eleven days after the fall, the first time being seen by the writer, he presented a good picture of facial paralysis of the right side. On the affected side he could neither frown nor wrinkle his brow. Of the right eye the lower lid was depressed, while the upper one was drawn up by the levator palpebrarum; nose flattened on the right side; mouth pulled to the left—he protruded his tongue in the median line. The uvula deflected to the left, and the sensibility to taste was diminished on the right side. A watch heard on the left side, at a distance of three feet, on the right could be detected only at four inches. An examination with the speculum showed the drumhead retracted, the manubrium shortened, the short process prominent, while the long process of the incus and the articulation between the incus and stapes could be plainly seen. In the meatus were some crusts of blood, while in front of the manubrium a line of clotted blood indicated the seat of rupture. The inflation of the middle ear produced no perforation hiss and did not relieve the deafness. A vibrating tuning-fork placed on the vertex was heard better on the left side. A blister was applied close to the ear and repeated after a fortnight, while faradization of the facial muscles during the first two weeks was performed; after this, strychnine in three doses was given three times daily. Five weeks later, although no improvement occurred in the hearing, the facial paralysis was much better. The interest in the case centered in the probable site of the lesion. The corda tympani was probably implicated from the impairment in taste. As there was paralysis of the levator palati and azygos uvulæ, the seventh nerve must have been injured above the junction of the ovidian, while the deafness on this side was undoubtedly due to lesion of the auditory nerve. The stapedius muscle (which derived its nervous supply from the portio dura) being paralyzed, produced foreshortening of the manubrium and retraction of the membrane, while the tensor tympani (supplied by the fifth nerve) pulled in the manubrium and so produced retraction of the drumhead. There were no cerebral nor meningeal symptoms, nor those indicating disease of the labyrinth, such as tinnitus, vertigo, etc., and no serous discharge, so that Booth thought that all the indications pointed to an extravasation, referred to that point of the canal where the seventh and eighth nerves lay together, and that pressure on them caused the trouble.

Bibliographical Index.

BOOKS.

ALARD, J.

Controverse entre l'Abbé de l'Epée et Samuel Hemincke au Sujet de la Veritable Manière d'instruire les Sourds-muets, traduite du Latin ; et État Actuel de la Question. Paris, 1881. 8vo, pp. 71.

ARNOLD, T.

A Method of Teaching the Deaf and Dumb Speech, Lip-reading, and Language. London, 1881. 4to, pp. 156.

BELUGON.

Du Catheterisme de la Trompe d'Eustache. (Thesis, Montpellier.)

CLAVEAU, O.

De la Parole comme Objet et comme Moyen d'Enseignement dans les Institutions de Sourds-muets. Rapport à M. le Ministre de l'Intérieur. Paris, 1881. 8vo.

GREAT BRITAIN.

Report of the Conference of the Governing Bodies of Institutions for the Education of the Deaf, held March 17 and 18, 1881 ; with an Appendix containing the Memorial to her Majesty's Government, and Report of the Interview with the Vice-President of H. M.'s Privy Council, Right Hon. A. T. Mundella, M. P. London, 1881. 8vo, pp. 87.

GUDE, W.

Die Gesetze der Physiologie und Psychologie ueber Entstehung der Bewegungen und der Artikulations-Unterricht der Taubstummen. Leipzig, 1880. pp. 80.

JONES, H. McN.

A Treatise on Aural Surgery. London, 1881.

LESUR, A.

De la Surdi-mutité. Paris, 1881.

LÖWENBERG, B.

Untersuchungen über Auftreten und Bedeutung von Coco-bakterien bei eitrigen Ohrenflüssen und über der durch ihre Gegenwart bedingten therapeutischen Indicationen. Wiesbaden, 1881.

MALLERY, G.

The Gesture-Speech of Man. Salem, 1881. 8vo, pp. 83.

MASSEI, F.

Clinica delle Malattie del Tratto Respiratorio. Naples, 1881.

MIOT, C., and BARATOUX, J.

Considérations Anatomiques et Physiologiques sur la Trompe d'Eustache. Paris, 1881.

MOOS, S.

Ueber Meningitis Cerebro-spinalis, insbesondere über die nach derselben Zurückbleibenden Combinirten Gehör und Gleichgewichtsstörungen. Heidelberg, 1881. 8vo, pp. 68.

POULET, A.

A Treatise on Foreign Bodies in Surgical Practice. London, 1881.

PRESBYTERIAN.

Fourth Annual Report of the Presbyterian Eye and Ear Charitable Hospital (Baltimore).

SEXTON, S.

Circulars of Information of the Bureau of Education, No. 5, 1881. Causes of Deafness among School Children, and its Influences on Education, with Remarks on the Instruction of Pupils with Impaired Hearing, and on Aural Hygiene in the Schools.

WEBER-LIEL.

Des Affections de l'Oreille Moyenne. Wien and Leipzig, 1881.

JOURNALS.

ADAMS.

Removal of the Membrana Tympani. St. Louis M. & S. J., Oct., 1881.

ANDREWS, J. A.

The Bone-Conduction of Sound. N. Y. M. J. and Obst. Rev., Feb., 1882.

On the Intermittent Perception of Sound as conveyed through the Cranial Bones. N. Y. M. J., Feb., 1882.

ANONYMOUS.

Changes in Medical Journals; The Journal of Otology. Boston M. and S. J., Feb. 23, 1882.

Boring the Ears. Lancet, Lond., Dec. 10, 1881.

Engine Drivers' Deafness. Lancet, Lond., Dec. 24, 1881.

Macrostoma; Cases, with Discussion. Lancet, Lond., Nov. 12, 1881.

L'Iodoforme contre l'Otorrhée Chronique. Archivio Chir. Ital., Jan., 1881; La Presse Med. Belge, May 15, 1881.

Suppositoires contre l'Eczema des Fosses Nasales et de l'Oreille. Jour. de Med. de Par. Nov. 5, 1881.

Impaired Hearing. Household, Brattleborough, Vt., Aug., 1881.

- Dispensary for Diseases of the Ear. M. & S. Rep., Phila., Jan. 7, 1882.
Was the Lifelong Malady of Dean Swift Ménière's Disease. Boston M. and S. J., Feb. 16, 1882.
- ATWOOD, F.
Report on Ophthalmology and Otology. Trans. Minn. State Med. Soc., 1881.
- AXON, E. A.
Quelques Faits à l'Appui des Observations de M'Hement, sur l'Accent des Sourds-muets qui ont appris à articuler. Comptes Rend., XCIII., 22, Nov. 28, 1881.
- BAGINSKI, B.
Die Funktion der Bogengänge des Ohrlabyrinths. Biol. Centralbl., Erlang., 1881, I. 438.
- BARATOUX, J.
Pathologie et Thérapeutique Générale de l'Oreille. Rev. Mens. de Lar., d'Otol., etc., Feb. and March, 1882.
- BELL, A. G.
Sur les Caractères offerts par la Parole, chez les Sourds-muets auxquels on a appris à articuler des sons. Comptes Rend., XCIII., 24, Dec. 12, 1881.
L'Influence de l'Heredité sur la Pronunciation des Sourds-muets. Comptes Rend., XCIV., 2, Jan. 9, 1882.
D'une Modification du Microphone de Wheatstone et de la Possibilité d'appliquer cet Instrument à des Recherches Radiophoniques. Ann. de Chim. et de Phys., XXV., Jan., 1882.
Sur un Appareil permettant de déterminer, sans Douleur pour le Patient, la Position d'un Projectile de Plomb ou d'autre Métal dans le Corps Humain. Comptes Rend., XCIII., 17, Oct. 24, 1882.
- BENNETT, C. H.
On the Sympathy existing between the Ear and Larynx. Spec. & Intel., Phila., Nov. 1, 1880.
- BLAU, L.
Die Diphtheritischen Erkrankungen des Gehörorgan bei Scarlatina. Berliner Klin. Wochenschr., 49 and 50, 1881.
- BLITZ, A.
Relation of the General Practitioner to Ophthalmology and Otology. Trans. Minn. State Med. Soc., 1881.
- BOSANQUET, R. H. M.
On the History of the Theory of Mistuned Consonances. Philosoph. Mag., XII., 75.
On the Beats of Mistuned Consonances of the Form $h : 1$. Philosoph. Mag., 70, 71, Dec., 1881 ; 79, Feb., 1882.

BOURBOWJE.

Sur un Transmetteur des Sons, à Table d'Harmonie Muniè de Cordes.
Comp. Rend., XCIV., 2, Jan. 9, 1882.

BRITISH MEDICAL ASSOCIATION.

Report of the Committee on the Study of Aural Surgery. Brit. M. J.,
Jan. 21, 1882.

BROWN, A. G.

Aural Notes. Lancet, Lond., Dec. 24, 1881.

BROWN, L.

Treatment of Inflammatory Affections of the Throat and of the Ears by the
Continuous Application of Cold. Specialist, Lond., Dec. 1, 1881.

BURNETT, C. H.

Scented Iodoform Powders for the Ear. Phila. M. Times, Feb. 11, 1882.

CALMETTES, R.

De l'Ophthalmoscopie dans les Maladies de l'Oreille. Progrès Med., Jan.
21, 1882.

CANELON, S.

Manómetro Auri. Rev. Med.-Chir., Buenos Aires, 1881-82, XVIII., 271.

CASSELLS, P.

Three Cases of Discharge from the Ear, with Destruction of Membrana Tym-
pani; Treatment. Glasgow M. J., 1881, XVI., 449.

Cases at the Glasgow Hospital and Dispensary for Diseases of the Ear, under
the Care of Dr. Cassells. Glasgow M. J., Jan., 1882.

CHISHOLM, J. J.

Twitching of the Tensor Tympani Muscle the Cause of Annoying Tinnitus.
Trans. Am. Med. Assoc., 1881.

CINISELLI, G.

Note Istologiche sull' Organo dell' Udito. Arch. per le Sc. Med., Torino, 1881,
V., 176.

COUSINS, J. W.

New Ear Protector for the Prevention of the Injurious Effects of Cold and
Noise. Brit. M. J., Dec. 31, 1881.

COZZOLINI.

L'Iodoforme dans l'Otorrhée. Gior. di Clinic. etéráp., 1re Ann., Fasc. II.,
Feb., 1882.

CZARDA.

Fixirapparat für Ohren-nasentrichter und Katheter. Wiener Med. Presse,
2, 1882.

Iodoform in the Treatment of Otorrhœa. Wiener Med. Presse. Revista
Medico-Quirurg., Dec. 23, 1881.

DALBY.

Otite Moyenne, Marche et Termination. Lancet, Vol. I., 280.

DÉCHARME, C.

Formes Vibratoires des Surfaces Liquides Circulaires. *Ann. de Chimie et de Phys.*, XXV., Jan., 1882.

DMITROWSKY.

Ueber die Bedeutung der anschwellung der von dem Ohregelegenen Lymphdrüsen. *All. Med. Central. Zeitung*, 84, 1881.

DUNCANSON, K.

Periscope of Otology. *Edin. M. J.*, Dec., 1881 ; Jan., 1882.

ELLIS, R.

Curious Horny Growth removed from the Ear. *Brit. M. J.*, Dec. 31, 1881.

FAY, E. A.

Tabular Statement of the Institutions of the Deaf and Dumb of the World. *Am. Ann. Deaf and Dumb*, XXVII., Jan. 1, 1882.

FLESH.

Contribution à l'Étude de l'Anatomie Normale et Pathologique de l'Organe de l'Ouïe. *Arch. f. Ohrenh.*, Nov., 1881.

FOGG, L. E.

Impaired Hearing. *Household*, Brattleborough, Vt., Jan., 1882.

FRAUTMANN.

Polype Fibreux de l'Apophyse Mastoïde ayant perforé le Conduit Auditif Externe et venant faire Saille au Dehors. *Arch. f. Ohrenh.*, XVII., 3.

FUCZEK.

Un cas de Bourdonnement d'Oreille comme Cause de Melancolie. *Berlin. Klin. Wehnschr.* 30, 1881.

GALLAUDET, E. M.

President Garfield's Connection with the Deaf-Mute College. *Am. Ann. Deaf and Dumb*, XXVII., Jan. 1, 1882.

How shall the Deaf be educated? *Internat. Rev.*, Dec., 1881. (Reprint, N. Y., 1881.)

GARDINER, E. J.

Quarterly Abstract of Ophthalmological and Otological Literature. *Chicago M. J. and Exam.*, Nov., 1881.

GARRIGON-DÉSARENES.

Observations Pathologiques et Traumatiques du Tympan. *Conseiller Med.*, Feb. 1, 1881.

GLAUERT.

Ein fall von Doppelhören. *Berl. Klin. Wehnschr.*, 1881, XIX., 714.

GONZALEZ ALVAREZ, B.

Una Otitis Media Supurada y Oos Operaciones de Mirinygodectomia. *Siglo Med.*, Madrid, 1881, XXVIII., 779.

GOTTSTEIN et KAYSER.

De la Diminution de l'Ouire chez les Serruriers et les Marechaux. *Bresl. Aerztl. Zeitschr.*, 18, 1881.

GRÜBER, J.

Zwei Fälle von Othaematoma. Allg. Wiener Med. Zeitung, 52, 1881.

HEMENT, F.

Reponse aux Observations de M. Gr. Bell. Comptes Rend., XCIII., 25, Dec. 19, 1881.

Note sur les Caractères qui presente la Parole, chez les Sourds-muets, auxquels on est parvenu à faire articuler des Sons. Comptes Rend., XCIII., 19, Nov. 7, 1881.

Nouvelles Observations, à l'Appui de ses Remarques sur les Caractères offerts par la Parole, chez les Sourds-muets qui parviennent à articuler des Sons. Comptes Rend., XCIII., 21, Nov. 21, 1881.

HOTZ, F. C.

Report on Ophthalmology and Otology. Trans. Ill. State Med. Soc., 1881.

HUGHES, C. H.

On the Importance of inspecting the Ears in Head Symptoms. St. Louis Cour. Med., Dec., 1881.

Progress of Otology. St. Louis Med., Dec., 1881.

HUNTER, W. T.

Fracture of Base of Skull; Recovery; Total Deafness in one Ear. Lancet, Lond., Nov. 5, 1881.

JONES, McN.

Zymosis in Relation to Aural Therapeutics. Specialist, Lond., 1881, 2, II., 37.

Some Remarks on Aural Therapeutics. Dublin J. M. Sc., Jan., 1882.

KINGSLEY, B. F.

A Novel and Simple Method of removing Insects from the Ear. Detroit Clinic, Feb. 15, 1882.

KINSON, A.

Deaf-Mutism. Lancet, Lond., Jan. 7, 1882.

KIPP, C. J.

Ear Affections from Inherited Syphilis. Trans. Am. Otol. Soc., 1880.

KIRCHNER, W.

Ueber die Einwirkung von Chinin und Salicylsäure auf das Gehörorgan. Berliner Klin. Wchnschr., No. 49, 1881.

KNAPP, H.

Das Baumwollkugeln als künstliches Trommelfell. Zeitschr., f. Ohrenh. Wiesb., 1881, X., 262.

KOENIG, R.

Bemerkungen über die Klangfarbe. Wiedemann's Ann., XIV. 11, 1881.

Ueber die Erregung harmonischer Töne durch schwingungen eines Grundtones. Wiedemann's Ann., 1880, 13.

Ueber die Beobachtung der Luftschwingungen in Ohrgepfen. Wiedemann's Ann., 8, 1881.

KOHLRAUSCH, W.

Experimentelle Untersuchung der Töne, welche beim Durchströmen von Gasen durch Spalten entstehen. *Wiedemann's Ann.*, 8, 1881.

KOLACER.

Contribution à la Théorie de Resonance. Abstract by E. Gripon, *Jour. de Phys.*, 2d. Ser., I., Jan. 1, 1882.

LADREIT DE LACHARRIÈRE.

De l'Otite Labyrinthique. [Extr. de l'Article "Oreille" du Dict. d. Sc. Med., sous Presse.] *Ann. d. Mal. de l'Oreille et du Larynx*, Par., 1881, VII., 277.

Du Bourdonnement. *Ann. d. Mal. de l'Oreille et du Larynx*, Par., Dec., 1881.

LEBARTE, J.

Sound Shadows in Water. *Silliman's J.*, XXIII., 133, Jan., 1882; *Philos. Mag.*, XIII., 79, Feb., 1882.

LOYD, J.

Fractures of the External Auditory Process of the Temporal Bone from Indirect Violence. *Brit. M. J.*, Feb. 11, 1882.

LÖWENBERG.

Der Furunkel des Ohres und die Furunculose. *Allg. Med. Central Zeitung*, 85 and 86, 1881; *Prog. Med.*, 27 and 35, 1881; *J. de Therap.*, Par., Dec. 10, 1881.

MANBY, A. R.

A Case of Acute Aural Vertigo. *Lancet*, Lond., Feb. 4, 1882.

MATHIEU, E.

Intégration des Équations Différentielles du Mouvement Vibratoire d'une Cloche Sphérique. *Comptes Rend.*, XCIII., 21, Nov. 21, 1881.

Sur la Théorie Mathématique du Mouvement Vibratoire des Cloches. *Comptes Rend.*, XCIII., 17, Oct. 24, 1881.

MCBRIDE, P.

Diseases which Involve the Organ of Hearing. *Edinb. M. J.*, Feb., 1882.

MERCADIER, E.

Application de la Radiophone à la Télégraphie. *Téléradiophone Electrique Multiple-Invasé. Comptes Rend.*, XCIII., 14, Oct. 3, 1881.

MINOR, J. L.

A Clinical Study of Fifty Cases of Ear Disease. *Virginia M. Month.*, Richmond, Nov., 1881.

MOOS.

Deafness among Locomotive Engineers. *Boston M. & S. J.*, Jan. 19, 1882; *Detroit Lancet*, Sept., 1881; *Jour. de Med.*, Par., Oct. 15, 1881.

NOGUET.

Deux Observations de Polypes de l'Oreille. *Bull. Med. du Nord.*, Sept., 1880.

ORCUTT, H.

Impaired Hearing. Household, Brattleborough, Vt., Feb., 1882.

OUSPENSKY, M.

Surdité Compliquée d'une Névrose et d'une Surdit  Hyst rique. *Ann. Mal. de l' Oreille et du Larynx*, Par., Dec., 1881.

PINDER, T. H.

Instruments for the Treatment of Diseases of the Ear. *Brit. M. J.*, Lond., 1881, II., 782.

POLLAK.

Necrosis of Mastoid Process. *St. Louis M. & S. J.*, Dec., 1881 ; *St. Louis Cour. Med.*, March, 1882.

POLLNOW, H.

Noch Einmal die Ohrenkrankheiten der Locomotivf hrer und Heiser. *Ztschr. f. Ohrenh.*, Wiesb., 1881, X., 285.

POMEROY, O. D.

A New Ear and Throat Mirror. *Trans. M. Soc. N. Y.*, Syracuse, 1881, 127.

A New Modification of the Ear Syringe. *Trans. M. Soc. N. Y.*, Syracuse, 1881, 130.

PRINCE, A. E.

Loss of Hearing due to Purpuric Extravasations. *Med. News*, Phila., Jan. 14, 1882.

RAYLEIGH, LORD.

On an Effect of Vibrations upon a Suspended Disc. *Cambridge Philos. Soc.*, Nov. 8, 1880. Abstract in *Silliman's J.*, XXIII., 133, Jan., 1882.

On a New Arrangement for Sensitive Flames. *Cambridge Philos. Soc.*, Nov. 8, 1880. Abstract in *Silliman's J.*, XXIII., 133, Jan., 1882.

REYNOLDS, D. S.

Address on Ophthalmology, Otology, and Laryngology. *Trans. Am. Med. Assoc.*, 1881.

ROOSA, D. B. St. J.

The Removal of Foreign Bodies from the Ear. *Med. Rec.*, N. Y., Dec. 10, 1881 ; *Med. T. & Gaz.*, Lond., Jan. 28, 1882.

The Expulsion of Insects from the External Auditory Canal. *Med. Rec.*, N. Y., Dec. 31, 1881.

The Significance of Pain referred to the Ear. *Med. News*, Phila., Feb. 11, 1882.

Sudden Deafness. *Ohio Med. Recorder*, June, 1880.

ROSEBRUGH, A. M.

Abscess of the Mastoid Cells from the Use of the Nasal Douche. *Canada Lancet*, Toronto, Aug., 1881.

SCHIFFERS, F.

Consid rations sur le Pronostic et le Traitement de l'Otorrh e. *Liege*, 1880.

SCOHZ.

Otorrhée Externe Chronique, Suivie de Myringite, de Perforation du Tympan, de Polype, d'Otite Moyenne Purulente, de Periostite et d'Abces Mastoïdien. *Arch. Med.*, Belges, 1881.

SEXTON, S.

The Treatment of Diseases of the Middle Ear and Contiguous Parts by milder Means than those commonly in vogue. *Med. Rec.*, N. Y., Jan. 21, 1882; *Phila. M. Times*, Jan. 28, 1882.

Discussion on Same Paper. *Phila. M. Times*, Jan. 28, 1882.

STEINBRUEGGE, H.

Ein Beitrag zur Topographie der Menschlichen Vorhofsgebilde. *Ztschr. f. Ohrenh.*, Wiesb., 1881, X., 257.

SUNÉ Y MOLIST, L.

Efectos de la Estrechez Nasal Sobre las Funciones del Oído. *Rev. de Cien. Méd.*, Barcel., 1881, VII., 497.

THEOBALD, S.

Maggots in a Child's Ear. *Maryland M. J.*, Balt., 1881-82, VIII., 350.

The use of Constitutional Remedies in the Treatment of Ear Diseases. *Med. News*, Phila., 4, 11, 18, Feb., 1882.

THOMPSON, S. P.

Phenomena of Binaural Audition. Part III. *Philos. Mag.*, XII., 76, Nov., 1881.

The Beats of Mistuned Consonances. *Philos. Mag.*, XIII., 78, Jan., 1882.

THOMPSON, W.

The Practical Examination of Railway Employés as to Color-blindness, Acuteness of Vision, and Hearing. *Med. News*, Phila., Jan. 14, 1882.

TURNBULL, C. S.

Amyl Nitrite in Tinnitus Aurium. *Med. & Surg. Reporter*, Phila., 1881, XIV., 669.

TURNBULL, L.

Otitis Intermittens, or "Malarial Otitis," with Observations on the Use of Quinine in Diseases of the Ear. *Trans. Am. Med. Assoc.*, 1881.

TYNDALL, J.

Action of Free Molecules on Radiant Heat and its Conversion thereby into Sound. Abstract of Bakeman Lecture given at Royal Society, Nov. 24, 1881. *Nature*, Jan. 5, 1882, XXV., 10.

VANCE, R. A.

Suppuration of the Ear and Lardaceous Disease of the Viscera. *Cincin. Lancet & Clinic*, Nov. 12, 1881.

WEIL.

Beitrag zur Lehre von der Ohrgeräuschen. *Monatsch. f. Ohrenh.*, Berl., 1881, XV., 181.

WILLIAMS.

Ear Cases. St. Louis M. & S. J., 1881, XII., 608.

ZAUFAL.

De l'Importance de l'Examen Ophthalmologique dans les Maladies de l'Oreille. Ann. d. Mal. de l'Oreille et du Larynx, Par., Dec., 1881.

Contributions à l'Étude de l'Oreille Interne des Vertébrés. Arch. f. Anat. u. Phys., H. 2 and 3.

Notes.

[THIS department of the JOURNAL will hereafter be open to contributors and subscribers for the insertion of notices of changes of residence, hospital and other appointments, and for such other items of otological news, including foreign correspondence, as may be of interest or importance; the right of editorial supervision and of rejection being strictly reserved.]

THERE is to be established in Baltimore, in the western section of the city, a charity hospital for the treatment of diseases of the eye, ear, and throat, to be known as the Baltimore Eye, Ear, and Throat Charity Hospital.

This institution will include the following clinics, which have heretofore worked independently. The Baltimore Charity Eye and Ear Dispensary, in charge of Dr. Samuel Theobald; the Eye and Ear Department of the Baltimore General Dispensary, conducted by Dr. S. L. Frank; the Eye and Ear Dispensary established in connection with the Church Home, by Dr. Russell Murdoch; and the Baltimore Throat Dispensary, under the management of Drs. J. H. Hartman and Samuel Johnston.

The above-named gentlemen, with the addition of Dr. I. Bermann in the ophthalmic and aural department, Dr. John N. Mackenzie in the throat department, and Dr. W. D. Booker as pathologist, will constitute the attending medical staff of the new hospital.

IN addition to other improvements which are being made at the Boston Dispensary, a clinic will be opened on Monday, April 3d, for the treatment of diseases of the ear; the clinic will be held three days in the week, from 2 to 3 P. M., and will be in charge of Dr. F. H. Hooper.

INTERESTING EXPERIENCE OF OBJECTIVE TINNITUS AURIUM.—The communication below, written at my request, will be recognized by many as characteristic of the writer, the late Dr. John Ellis Blake. Dr. Blake was well known to the profession of New England, which was the place of his birth, and especially to Middletown, Conn., which had been the field of a most successful general practice. Acknowledged to be a man of genius, his unfortunately brief career was characterized by great versatility of character. The last few years of his life were passed in New York city, where he had numerous friends, and was

highly esteemed for not only his worth as a physician, but for his fine sense humor and social qualities. Notably a surgeon and obstetrician of recognized ability he was only a casual contributor to medical literature, for he had withal a modest way of avoiding the usual methods of professional advancement, but what he wrote was sufficient to demonstrate his keen observation and excellent judgment in more than one department of medicine. Although a more attractive record might have attended the pursuit of special work in some one department had the health of his later years permitted, yet this would never have eclipsed the reputation for breadth of character which had been attained by his successful course in general practice.

SAMUEL SEXTON.

26 WEST 19TH STREET, NEW YORK, March 3, 1882.

MY DEAR DR., — At your request I will endeavor to recall the facts in respect to two rather curious cases of "objective tinnitus." Some years since I was annoyed very much by a sort of crackling noise in my ears just as soon as I lay down in bed. It was so loud and persistent that I found it almost impossible to sleep. I had never had any trouble with my ears, and this crackling noise never manifested itself except at night and when in bed. I must confess that not only was I annoyed by this thing, but much puzzled. It was true that, some time before this, I had been run into on a very dark night, my wagon demolished, and I myself landed on a pile of stones; still, I reasoned that any well-educated practitioner at all experienced in country practice ought to be able to meet a little common occurrence like this without serious injury to his head.

Still the annoyance continued, and, had I not been at the time so tied down with professional work, I would have taken the advice, in the matter, of some aurist. One day, happening to speak of the annoyance these noises in my ears caused me before a lady patient, she said, "I once knew of a case that seemed like yours, and the trouble was found to be not in the ears at all, but was due to *worms in the feather pillow.*" Acting on this hint I had my pillow opened, and the cause of the trouble was evident enough.

It was literally alive with the larvæ of some insect, — perhaps some sort of moth. The quills of the feathers and other parts had been so gnawed as to be a mass of fine fragments.

It was evident that the weight of my head had set this lively colony into activity, and my every restless movement had kept it up.

Sincerely yours,

JOHN ELLIS BLAKE.

WANTED. — One dollar a copy will be paid for copies of the AMERICAN JOURNAL OF OTOTOLOGY, No. 1, VOL. I. Subscribers having copies they do not wish to bind will confer a favor by sending them at once to Houghton, Mifflin & Co., Riverside Press, Cambridge, Mass. Please mark the name of the sender on the wrapper, also notify by postal card.

THE AMERICAN JOURNAL OF OTOLOGY.

VOL. IV.—JULY, 1882.—No. III.

Original Communications.

THE GROWTH OF OTOLOGY IN THE UNITED STATES, AS REPRESENTED BY THE NUMBER OF PATIENTS TREATED IN CHARITABLE INSTITUTIONS.

By GORHAM BACON, M. D.

AURAL SURGEON NEW YORK EYE AND EAR INFIRMARY.

I HAVE endeavored in the following pages to give a short account of the growth of some of the older ear infirmaries, as well as the statistics of all patients treated for ear diseases in this country, as far as could be obtained.

It is well known that, twenty years ago, otology was in its infancy in this country, although in 1821, Saunders' work on the Ear was republished in Philadelphia from the London edition, and a translation of Saissy's "Treatise," by Nathan R. Smith, appeared in 1829, in Baltimore.

In August, 1820, it was decided to establish in New York an eye infirmary, and accordingly two rooms were rented in the second story of a building in Chatham Street, and it was made publicly known that poor patients, with diseases of the eye, by applying on certain days and hours of each week, would be gratuitously treated. In a space of a little less than seven months, four hundred and thirty six patients had applied for and received treatment from the surgeons. It was in this way that the New York Eye Infirmary was started. A public meeting was held at the City Hotel, in March, 1821, "for the purpose of adopting the means of perpetuating the infirmary." The

meeting was a successful one, and the permanent organization of the infirmary established. The institution, the first one founded in America, was thus fairly started. In January, 1822, appeared the first annual report made by the surgeons, showing that during the seventeen months of its existence, one thousand one hundred and twenty patients had been treated. The infirmary was carried on with very limited means till 1845, when a house in Mercer Street was purchased and sufficiently enlarged, as the directors then thought, to accommodate all patients for years to come; but the population increased so rapidly, it was found necessary to make another attempt to secure a more commodious building. Finally, in 1856, the new building on Thirteenth Street and Second Avenue was completed, and has since been occupied and known as the New York Eye Infirmary.

In the thirty-fifth annual report there were treated four hundred patients with diseases of the ear. At this time the same surgeons treated both eye and ear cases, and it was not till 1864, when the institution changed its name to that of the New York Eye and Ear Infirmary, that two aural surgeons were appointed and the two departments of eye and ear became separated, and each had its own surgeons. The number of patients with ear diseases has been gradually becoming greater each year. During 1871, one thousand nine hundred and ninety-six patients received treatment. In 1874, two thousand four hundred and thirty-nine; in 1877, two thousand six hundred and seventy-nine. In the last annual report, for the year ending September 30, 1881, the number of ear cases was two thousand eight hundred and eighteen.

The Manhattan Eye and Ear Hospital, chartered May 5, 1869, opened a daily clinic for the gratuitous treatment of the poor in a temporary building in Thirty-fourth Street.

The first annual report appeared in January, 1871, and showed that four hundred and thirty patients with diseases of the ear had received treatment from October 15, 1869, to December, 1870. The patients have increased in numbers with each year, and in the annual report from October 15, 1879, to October 15, 1880, eight hundred and thirty-six patients with diseases of the ear received treatment at this institution. A new building on Park Avenue and Forty-first Street has

been completed and occupied during the past year. For the year ending October, 1881, there were eight hundred and thirty-eight ear cases.

The New York Ophthalmic and Aural Institute began its existence and was duly incorporated in 1869. In the first annual report for the year ending April 30, 1870, four hundred and forty-one patients with diseases of the ear were treated in the dispensary. In the eighth annual report for the year beginning January 1, 1877, and ending December 31, 1877, there were treated in the dispensary for the diseases of the ear, eight hundred and thirty-one, and in the last annual report for the year ending December, 1881, the number had increased to one thousand and forty-nine patients.

The New York Ear Dispensary was first opened for the reception of patients May 25, 1871, at 69 West Thirty-fifth Street, and in June was removed to Ninth Avenue and Thirty-sixth Street. It was located on the west side, as nearly all the institutions affording medical aid to those patients afflicted with ear diseases were situated on the east side of the city. Ear diseases being so often caused by præexisting throat troubles, it was thought that deafness might be prevented in many cases by an early treatment of the throat. Accordingly a throat department was added, and shortly afterwards a dental department. Up to June, 1873, three hundred and sixty-four cases were treated, a large number being children; twenty-nine of these were throat cases. During 1876, five hundred and three cases of diseases of the ear received treatment, and fifty-three throat cases. In the seventh annual report the surgeon in charge reported that during the year the number of patients was eight hundred and seventy-four, a steady increase in numbers. During the year ending January 30, 1880, there had applied two thousand and ninety-one patients at the infirmary.

The first annual report of the *Brooklyn Eye and Ear Hospital* was published in April, 1869, and during the previous twelve months of its existence three hundred and eighty patients with diseases of the ear applied for relief. In the fifth report, which appeared in January, 1874, six hundred and sixty-four patients with ear diseases received treatment during the year, almost double the number received the

first year. There has been a gradual increase each year in the number of patients, and during 1881, from January to December inclusive, there were one thousand one hundred and ninety-three patients.

The Massachusetts Charitable Eye and Ear Infirmary, the second eye and ear institution established in America, was founded in November, 1824. A room was hired in Scollay's Buildings, and it was first known as an eye infirmary. It was fitted up with such conveniences as limited means could procure, and those afflicted with diseases of the eye were welcome to come for gratuitous aid; no less than eight hundred and eighty-six persons, presenting almost every variety of diseases, applied at the rooms during the first sixteen months. The labors of the surgeons had met with such decided success that it was thought expedient to present the claims of this class of the poor to public attention.

Those present at the meeting called in March, 1826, were so impressed with the usefulness of the institution, that a subscription was immediately started. In February of the same year the institution became incorporated by the State Legislature, under the title of the *Massachusetts Charitable Eye and Ear Infirmary*. It was still located in the same building until the 6th of May, when it was removed to the corner of Court and Tremont streets. Six years later it was removed to Summer Street, where it continued for four years, until in 1836 the Gore Mansion House in Green Street was purchased. The changes were thus repeatedly made to supply accommodations for the patients, who came in greater numbers each year, and rooms were finally set apart in the new building, where the more serious cases could be housed and cared for. The institution soon felt the influence of the extraordinary number of immigrants, so that the Green Street house became too small for all who applied for relief. Subscriptions were raised and help obtained from the State Legislature; thus the trustees were enabled to purchase a lot on Charles Street and erect the present building, which was completed in May, 1850.

In 1871, the two departments of the eye and ear were separated, and more special attention given to ear complaints, and the number of cases greatly increased. In the annual report for the year ending September 30, 1875, there were two thousand and eighty-five ear pa-

tients. Each year a greater number of patients have applied for relief, so that it has been necessary to enlarge the building. In the last annual report from October 1, 1880, to October 1, 1881, no less than two thousand nine hundred and twenty-two patients with ear diseases were treated.

Patients with diseases of the ear are also cared for at the *Out-patient Department of the Boston City Hospital*. During the year, from April 30, 1878, to April 30, 1879, three hundred and twenty-seven patients with ear diseases were admitted for treatment. From April 30, 1879, to April 30, 1880, there were three hundred and twenty-nine. In the last annual report, for the year ending April, 1881, there were three hundred and three.

The Presbyterian Hospital of Philadelphia established an out-patient department for diseases of the ear on December 1, 1881, and when the eleventh annual report appeared this department had existed but one month; but in this short space of time sufficient work had been done to show that this department will find ample employment in the future.

In *Baltimore*, patients with ear diseases are received at the *Charity Eye and Ear Dispensary*, which has been in existence for seven years. During the year ending April 14, 1881, eighty-seven patients were admitted for treatment.

St. Vincent's Hospital also has every advantage for the treatment of ear diseases, and rooms especially adapted to the purpose are set apart. It is purposed to establish in this city a charity hospital for the treatment of diseases of the eye, ear, and throat, to be known as the *Baltimore Eye, Ear, and Throat Charity Hospital*. There will be an out-patient department or dispensary, and in the hospitals proper only those patients who demand careful in-door treatment will be admitted.

The Newark Charitable Eye and Ear Infirmary is one of the infirmaries lately established. The first annual report from February 1 to December 31, 1880, showed that there had applied to the infirmary eight hundred and twenty-six patients with ear diseases. In the last report for the year, from January 1 to December 31, 1881, the number had increased to eight hundred and seventy-two.

In the *Dispensary* of the *Albany Hospital* during the two years ending March, 1880, two hundred and twenty-eight new ear cases were received, while in 1872 there were only eighty-five.

St. Peter's Hospital in Albany was founded in 1869. A dispensary for out-door patients was established at the same time. From January 1, 1876, to January 1, 1880, two hundred and sixty-six patients with diseases of the ear applied for treatment.

There is an *Eye and Ear Department* connected with the *Troy Hospital*. In the reports for the two years ending December 31, 1877, one hundred and seven new patients with ear diseases were treated there.

The *Buffalo Eye and Ear Infirmary*, incorporated in 1876, has been open for the reception of patients since then. In the fifth annual report for the year 1881, fifty-one new cases were recorded.

At the *New Haven Dispensary*, incorporated in 1872, a few ear cases are received each year. For the year 1877, fifty-one were received. In the ninth and tenth annual reports there were seventeen in 1880, and nineteen in 1881.

In Chicago, the *Charitable Eye and Ear Infirmary*, established in 1858, treated, during the first year of its existence, ending May 1, 1859, twenty patients with ear diseases. For the year ending May 1, 1861, fifty-one cases. During 1869, one hundred and fourteen, and in 1870 there were one hundred and eighty-eight ear cases. In the great fire which swept over the greater part of the city, the Infirmary building, with all its furniture, was destroyed. Immediately after this calamity, donations of money, furniture, and provisions were received in sufficient amounts to enable the infirmary to secure limited accommodations, and to receive without delay such patients as applied for treatment. In 1874 the new building was finished and occupied, and during the year ending November 30, 1874, one hundred and seventy-six patients with ear diseases received treatment. During the year ending September 30, 1876, two hundred and sixty-six ear cases. In the annual report for the year ending September 30, 1880, there had been treated four hundred and forty-four cases.

The list of institutions to which I have referred is a complete one, as far as could be obtained, but it does not show nearly all the ear

cases treated at the various charitable hospitals and dispensaries. Patients with ear diseases are received at the Out-door Department of Bellevue Hospital; also at the dispensaries for general diseases in New York, and many of the larger cities. The statistics of many of these I have been unable to obtain. As many as eight hundred and fifty new ear cases were treated during 1881 at the German Dispensary in New York. At the Northeastern Dispensary there were one hundred and nine. In the same city there are classes at which the ear is treated at the New York, Demilt, Eastern, Northern, and Northwestern Dispensaries.

Some of the institutions publish no official reports; others have issued no reports for several years, and still others keep no statistics whatever. If the organizations in the larger cities were better, doubtless special work would very much increase the number of such applicants, as has been the case at the New York Eye and Ear Infirmary, the Massachusetts Charitable Eye and Ear Infirmary, and the Brooklyn Eye and Ear Hospital.

STATISTICS FOR 1881.

	For year ending	Ear patients.
New York Eye and Ear Infirmary . .	October 1, 1881,	2,818
Mass. Charitable Eye and Ear Infirmary .	October 1, 1881,	2,922
Manhattan Eye and Ear Hospital . .	October 15, 1881,	838
Buffalo Eye and Ear Infirmary . . .	October 1, 1881,	51
Brooklyn Eye and Ear Hospital . . .	December 31, 1881,	1,193
Newark Charitable Eye and Ear Infirmary .	December 31, 1881,	872
New York Ophthalmic and Aural Institute .	December 31, 1881,	1,049
Baltimore Charitable Eye and Ear Dispensary	April 14, 1881,	87
Boston City Hospital	April, 1881,	303
New Haven Dispensary	November, 1881,	19

Almost half the number of these, namely, 4,705, were treated in New York institutions; 3,225 in Boston, and 1,193 in Brooklyn.

The usefulness of many of the annual reports would be very much increased if more satisfactory statistics of in-door patients were given, and the nomenclature of cases could be much improved if some uniformity were adopted.

It will thus be seen from the history of the growth of otology in America, that its foster-mother was ophthalmology; but it is now

so completely a specialty of itself, having cast off the leading-strings, that it is represented by two journals, exclusively devoted to the ear, and that in no department of medicine has its literature advanced more satisfactorily, — several American treatises now existing, and a large number of monographs and translations. In the *Index Medicus* a fair proportion of the articles are by American writers.

The names of the gentlemen who have been connected with each of the institutions are well known, and it is owing to their labors that otology has made such advances in this country.

NOTE. — The author proposes to publish in this journal each year the statistics of the ear infirmaries in the United States, and would be glad to have the reports for 1882 mailed to him, from those gentlemen having charge of such institutions.

OTALGIA FROM REFLEX DENTAL IRRITATION.

By D. BRYSON DELAVAN, M. D.,

NEW YORK.

OTALGIA due to reflex irritation is probably of more frequent occurrence than has heretofore been supposed. Not to mention the commonly observed phenomenon of pain in the ear, accompanying acute affections of the tonsil, it is well known also as a not unusual and an extremely painful complication of tubercular, cancerous, and syphilitic disease of the pharyngeal region. The writer has seen two cases where otalgia, due to malignant disease of the pharynx, was treated locally for a considerable length of time before the presence of the cancer was recognized.¹ Although it is not strange that irritation in other parts of the buccal cavity, equally remote from the ear, should result in the same reflex neuralgic symptoms, it is remarkable that they should occur upon the side *opposite* to the point of irritation. As illustrating the possibility of this, however, the following case possesses interest.

The patient was a finely developed, well nourished girl of about twenty, with clear complexion, active circulation, and every apparent indication of robust health. Her family history was excellent, and there was no suggestion of any heredity. She had always enjoyed perfect health, with the exception of an attack of double otitis media, at the age of seven. At this time there was a purulent discharge from both ears. Since then has always been slightly deaf in the right ear. The present attack began with pain in the right ear. The pain was constant and throbbing, with occasional paroxysms of lancination, and was much more severe at night. This condition grew worse, producing almost complete insomnia. She was first seen four days after the beginning of the attack. Examination with the otoscope revealed both tympani in a healthy condition, with no sign

¹ "Primary Epithelioma of Tonsil." New York Medical Journal. April, 1882.

whatever of inflammatory action either of the external or of the middle ear. Rhinoscopic examination failed to discover any cause in the pharynx, both the tonsils and the parts in the retro-nasal space being remarkably free from hyperæmia. The upper teeth were perfect. In the lower jaw the right second molar was slightly carious, while the right wisdom tooth had not yet made its appearance. On the left side the wisdom tooth was through, but the second molar was wanting. Patient stated that several years ago this latter tooth had decayed and come out. Application of heat and anodynes to the affected ear gave temporary relief, but their good effects never lasted more than three or four hours. The otalgia was apparently reflex, and seemed due, in all probability, to irritation from the developing wisdom tooth of the right side, or from the carious second molar of the same side. The patient was seen in consultation by Dr. Samuel Sexton, who agreed with this hypothesis. At his suggestion she was referred to a competent dentist, who discovered that the deficient second molar of the left side had only lost its crown, while the roots were still impacted in the jaw, although completely covered by mucous membrane. With considerable difficulty three large roots were removed. At the extremity of one of these a sacculated abscess of extraordinary size was found. The wound caused by the removal of these fragments soon healed, and the otalgia quickly disappeared. Since the operation—two months—the carious right second molar has not been filled, nor has the right wisdom tooth yet completed its irruption. Nevertheless, there has been no return of the otalgia whatever.

Few instances, if any, have been reported where irritation, not only far removed, but actually upon the side opposite to the neuralgic manifestation, has resulted as in the case above. And yet, from the almost immediate relief which followed the operation, there can be no reasonable doubt as to the relation of cause and effect between the alveolar abscess and the neuralgia.

It appears, therefore, that a disordered condition of the teeth may exert a powerful influence upon parts with which they seem to have but little nervous connection, and the inference is forced upon us that in many cases of cephalic neuralgia the true cause lies in dental irritation, so that relief is not likely to be afforded until the irritation has been removed.

THE MECHANICAL TREATMENT OF SUPPURATIVE
INFLAMMATIONS OF THE TYMPANUM.

By H. N. SPENCER, A. M., M. D.,

St. Louis.

THIS article is intended as supplementary to an article which appeared in the American Journal of Otology, Vol. II., No. 3, July, 1880, entitled "The Dry Treatment in Suppuration of the Middle Ear." I now use the term *mechanical* as opposed to *medicinal*, and I have chosen it in preference to using the phrase "dry treatment," for this latter has been applied to the treatment of suppurative troubles by the insufflation of powders, to distinguish this from the treatment by the instillation of fluids. Further and sufficient experience has confirmed me in the views which I advanced at that time, and the subject is one of such importance that I feel called upon to advert to it again. The evils which may result from the treatment of suppurative processes in the tympanum — acute or chronic — by the forcible injection of water, and the instillation of fluids, are recognized at the present day by aural surgeons generally that it would be out of time and place to dilate upon such procedures.

The *antiseptic* treatment of these disorders received a valuable impetus from Listerism, which has pervaded every department of surgery. The adaptation of means to an end has wrought the substitution of a dry antiseptics for other forms, — washes, spray, etc., which perform the important office of Listerism in other localities, and under other conditions. I shall make very brief reference to the methods and agents which otologists have employed, and it will serve to mark the steps which have led to that method which I have adopted.

Modern surgery, in its almost feverish heat after new remedies against the dangerous micro-organisms, has traversed the entire domain of therapeutics, and has laid tribute upon every new con-

tribution of the pharmacist's art. Gruber,¹ in an article published 1880, discusses the relative value of many of these agents from the stand-point of otology, and details his manner of using them, which will answer to illustrate the general practice. After considering carbolic acid, salicylic acid, thymol, etc., he proceeds to give his experience with two other remedies which have come to be highly regarded in aural therapeutics, and are in very general use to-day, natrium boracicum (common borax) and boracic acid. He says (I translate from the article referred to): "Another remedy for chronic inflammatory processes accompanied with otorrhœa, which for fifteen years I have used and recommended, is common borax. . . . I prescribe it in solution for instillation into the external auditory canal, for injection through the Eustachian tube,² and lastly, as a gargle for simultaneous affections of the throat. I have not used it in powdered form, as I have been afraid that it would produce effects similar to those which I have observed when using alum powder, *i. e.* the formation of concretions in the depth of the canal, which might give rise to very disagreeable complications. Of boracic acid Bezold speaks highly. He praises its antiseptic properties and other advantages, 'the first of which may be regarded a *complete absence* of a reaction of the mucous membrane of the middle ear under its application and operation.' He recommends the following method when using it: After the meatus and cavity of the drum have been carefully cleansed by an injection of a saturated solution of boracic acid, and after thoroughly drying it, and having used the air douche, finely powdered boracic acid is blown in by means of the powder-blower. After this a little of the powder is poured into the canal, which is then closed with salicyl-carbolated cotton. These manipulations are to be repeated as often as the wadding is noticed to be moist with any of the secretion."

Professor Gruber states that he has employed this method of treatment in a great number of cases, and has never noticed any irritation

¹ Allgemeine Wiener Medizinische Zeitung. No. 30. July, 1880.

² I believe that the weight of authority on this side of the water would be opposed to the injection of fluid by the Eustachian tube, as well in these forms of disease as in the non-suppurative.

that could be ascribed to its agency as the cause, and adds: "On the contrary, its influence on the exudation of the inflamed parts has been so remarkable that I consider this method of treatment one of the most valuable." He goes on to say, "To convince myself whether boracic acid or borax has greater effect in controlling otorrhœa, I made test experiments with the latter, proceeding in the same way as has been described" (Bezold's method). His conclusions were, "That pulverized boracic acid diminishes otorrhœa more than does borax; that in solution of the same concentration the solution of borax is more effectual than that of boracic acid."

Opposed to the method of Bezold, as here described, which is the common practice, with slight modification, influenced by pathological stages and conditions, is Becker's method, which dispenses entirely with the bath. The latter employs the cotton-holder and absorbent cotton in conjunction with the air douche for the removal of secretions. Dr. Todd, of St. Louis, in a paper entitled, "The Dry Method of Treatment of Discharges from the Ear,"¹ presents in a very forcible and convincing manner the arguments which have led to the substitution of a dry treatment for the old method in which the syringe was freely employed.² My own experience has led me to the conclusion, that in chronic troubles rarely, in acute ones never, do we need to employ the bath for the removal of products of inflammation. In the one case it is inefficient, in the other wholly impracticable. The manifold and complicated recesses of the cavum, the drum-head being swept away, are inaccessible to any force of the syringe that could be with safety employed; and most certainly an opposing drum-head places a further and insuperable obstacle in the way in proportion as its integrity is unimpaired. As I have expressed my convictions so decidedly, I desire, as a matter of record, to state that this rule is not

¹ Transactions Missouri State Medical Association. 1880.

² Dr. Todd recommends very highly the use of powdered borax. In my experience I have not found this remedy as beneficial as I had hoped, — its effect being in acute processes to heighten the inflammatory tendency. I have not infrequently observed a corrosive influence which must arise from a product of chemical union between it and the secretions. In the dryer inflammation affecting the dermoid coat of the meatus, it does not produce this effect, and is a most valuable remedy. For this latter use of borax I am indebted to a suggestion from Dr. Todd.

without exception, particularly in the case of chronic suppurations. Dr. Blake has rendered a valuable service to otology in the contribution of his middle ear syringe. As there will be required, at times when the accepted and most highly approved remedies have failed, that we resort to other medical means,—so there will be conditions when we shall be compelled to use water,—to detach hidden and intractable masses covering seats of disease, and which render any progress toward recovery impossible. These masses will most often be found in the recesses of the roof, and those posterior in the direction of the mastoid.

The mechanical treatment of ear suppurations is especially applicable to the acute forms, but it is also of great value in certain chronic conditions and other forms of inflammations to which I shall refer later on. This method of treating acute suppurative otitis has been employed by me now in a great many cases, and with such signal good results that it is only in very exceptional instances that I deviate from it. The theory of it is founded upon the same law as that which governs the general surgeon in the treatment of similar conditions of inflammation located elsewhere. It may be summed up in one word, *compression*. The object is to dispose of stagnant blood, and to prevent the afflux of blood to the seat of disease. It would be an axiomatic statement to add further, where there is no stasis of blood there can be no suppuration, and where the afflux of blood is estopped there can be no inflammation. To meet these plain indications I have employed the air douche and a cotton compress placed at the fundus of the external auditory canal. The office of greatest importance which is performed by inflation of the ear is the compression which is made upon the tympanal walls through the direct impulse of air, and the continued pressure which the air is enabled to exercise, the channel for its normal introduction being reëstablished. This operation, of momentous importance in the first stage of inflammation, exercises a healthful influence throughout, apart from the effect it has of freeing the cavity when suppuration has set in, and the drum-head has been ruptured. Following the same reasoning I have been led to apply compression and support to the external surface of the membrana tympani, and to the walls of the

external auditory canal, which not infrequently become involved in the inflammatory process. The compression which is made by the cotton is uniform and constant, and upon the walls where the underlying tissues are bone it will be seen that it can be made most efficient. The absorbent cotton at the same time does not offer an obstruction to the exit of matter from the cavity of the tympanum ; on the other hand, it rather encourages it from its ready absorption of fluid. It is not necessary to state that the compress should be removed as frequently as it becomes saturated, and a fresh one be introduced. In my experience this method of treatment in the early stages of pain will commonly obviate the necessity for leeching — patients frequently being affected by the greatest sense of relief, who, before the operation, were suffering intensely. A plug of antiseptic cotton may be placed over the compress, and in adults an antiseptic spray application should be made to the accessory cavity of the posterior nares. In young children the spray of course becomes a formidable operation, and a mild ointment snuffed through the nostrils suffices to remove accumulations from the neighborhood of the pharyngeal orifices of the tubes, which may be medicated also to suit the condition of the mucous membrane to which it becomes applied. This means of treating these cavities can be instituted effectually in infants by closing the mouth with two fingers of the hand when the expiration in crying has been completed, forcing the inspiration to be taken through the nostrils. It is necessary to be thus explicit, believing that attention to details influences largely the success of treatment. I attach great importance, also, to the constitutional treatment in these cases, and the system should be recovered as promptly as possible from the depression and consequent derangements of function which are induced elsewhere in the system. The subjects of this disease, when we leave out those cases which have supervened upon fevers, etc., are of a low constitutional habit. Therefore, so soon as the indications for relief of pain have been met, whether by opiates or through creating a diversion by means of laxative and sudorifics, a tonic treatment should be instituted which may be expressed by one of the malt preparations, cod-liver oil, quinine, or iron. It will often be found of great advantage to give a medicine with specific reference

to the nature and location of the inflammatory process which is going on. At the head of this class of remedies I should place mercury.

The best argument for a method of treatment to establish its claim to superiority over other methods in use must be in results which have been obtained. I regret that I have not preserved records with special reference to this from the time when I first began to employ the mechanical treatment. It will suffice, however, to give statistics from recent practice, and I am confident that the results in a greater number of cases would not differ materially from this. In forty-six consecutive cases—four were recovered under four days; seventeen within six days; four within seven days; twelve within ten days; four were treated for two weeks; three for three weeks; and in two cases the treatment was prolonged to six weeks. In each of the protracted cases the syringe had been employed previous to the time when the case came under my care. In one instance the aural inflammation was complicated by a low grade of fever (typhoid), to which the ear trouble was a sequel.

The Mechanical Treatment in Chronic Suppuration. It might be a difficult matter to state just where acute suppurative processes terminate and chronic suppuration begins. But I refer in the use of this term, and so far as this method of treatment is applicable, to the continued suppurations in which only a limited destruction of the outer wall of the tympanum has occurred. There exists no longer the indication for that use of the cotton which obtains in the acute inflammations. The office which it performs may be said to be largely a protective one to the tympanum against evil influences from without. In this class of cases it is not a substitute for the *dry* treatment, but supplements it rather, and the advisability of its employment must be governed by the judgment of the surgeon. In a number of instances I have effected through its operation a growth of membrane in the same manner as this is brought about by Blake's paper disc. It has been in the smaller ancient openings, and taking advantage of a period of arrest in the suppurative process. Using the cotton for this purpose, I would recommend moistening the surface which is presented to the drum-head; and, subsequently

found to be adherent, it should not be disturbed, its detachment being effected in time by natural process. There are other forms of chronic suppuration of the tympanum where there is a greater loss and relaxation of the membrana tympani than is contemplated in those cases just referred to, which we would expect to obtain relief for in the treatment by compression. As in the acute stage of inflammation, when from closure of the Eustachian tube and the consequent vacuum which occurs, we have the pressure taken off from the walls, and the relaxation of tissue which favors extravasation from the tympanic vessels, so in many chronic suppurative processes the discharge is kept up by the lack of support, which is supplied when the normal relation of the parts to each other is sustained. There is a want of tone and a proper vitality of tissue to place a stop upon this waste.

In these cases, being located where compression can be made to exercise a proper and evenly distributed support, I should hope for and have seen the greatest amount of good to result from this method of treatment.

MICROPHOTOGRAPH OF A PECULIAR PEAR-SHAPED BODY FOUND IN THE MIDDLE EAR.

By ALBERT H. BUCK, M. D.,

NEW YORK.

THE accompanying plate is a photolithographic copy of a microphotograph taken by Professor J. W. S. Arnold, M. D., of this city. It represents one of those minute pear-shaped bodies which Professor Politzer and Professor Kessel discovered, independently of each other, in 1869. (See Vols. V. and VI. of the *Archiv für Ohrenheilkunde*.) In Professor Politzer's communication two rather coarse wood-cut illustrations of these structures are given, but, so far as I can learn, these are the only cuts that have as yet been published. The specimen here represented is so perfect in all its connections, and the photographer's work has been so well done, that it seemed to me that a photolithographic copy was worthy of being preserved in a journal devoted to otological matters.

So far as the specimen is concerned, from which the photograph was taken, I may say that it was prepared in the autumn of 1869, in the laboratory of Professor Julius Arnold, in Heidelberg. It represents a horizontal section through the stirrup and surrounding bony structures of the oval window. The membranous net-work shown in the plate was found stretched out between the posterior limb of the stirrup, the tendon of the stapedius muscle, and the wall of the niche for the oval window. The fresh specimen — which, if I remember rightly, was obtained from the body of an infant, — had been treated first with a very weak solution of chromic acid and hydrochloric acid, and then with absolute alcohol. The section itself was treated with oil of cloves and mounted in damar varnish. The photograph was taken directly from the slide by Professor J. W. S. Arnold, in the early part of 1870, and the magnifying power of the lens employed was about fifty diameters.



VASCULAR TUMOR (ANEURISMAL) OF THE DEEPER
PART OF THE EXTERNAL AUDITORY CANAL.

By CHARLES A. TODD, M. D.,

St. Louis.

MR. C——, of Illinois, aged forty-five years, consulted me May 17, 1880, on account of aural disease. He gave this history: In 1858 he had an acute otitis in both ears; hot poultices were applied for three nights, when the ears “broke,” and the pain ceased. Since that time the hearing has been imperfect. He served three years in the Civil War in the infantry. At the siege of Vicksburg was stationed with the artillery, and was much exposed to bad weather. At that time he contracted pharyngitis. In 1876 he consulted an aural surgeon on account of the increasing deafness, who stated that there was tubal catarrh, right tuba being nearly closed, the left not so much so. For seven to eight years he had been more or less constantly annoyed by a throbbing noise that came on gradually, and at first seemed to be in both ears, but which finally he fixed in the left. This noise was increased upon violent muscular exertion, as in lifting.

Condition at time of visit: Complained of pain and swelling about left ear, which had been considerable in front of the tragus and under the lobe. He supposed from the symptoms that the ear was about to “break again.” The tubæ were partly closed, the right most so. On account of the “throbbing” noise complained of, the hearing distance could not be satisfactorily determined, though it was plainly markedly diminished. The right membrane was opaque, not much sunken. Near the bottom of the left auditory canal inferior wall, and hiding the membrana tympani, there could be seen a small swelling that looked like a furuncle or circumscribed otitis externa of some nature. I was already inclined to this diagnosis by the history and symptoms. The patient was anxious for immediate re-

lief, and intended leaving the city shortly. *Secundum artem*, I lanced the supposed furuncle, the point of the curved knife striking the bone readily. A profuse flow of semi-arterial blood promptly followed the cut, and necessitated solid tamponing. About three to four ounces were lost before the gush could be stopped. Decidedly here was a variation from the usual type of furuncle. The next day I cautiously removed cotton and clots, and could see a collapsed sac in place of the swelling. Bleeding recommencing, the tampons were replaced, and were not finally taken out for several days. The swelling persisted unchanged, filling with blood upon removal of the tampons. Pressing upon it with a probe, pulsation could be seen. This was not perceptible when the canal was filled with water. The "throbbing" noise was found to be synchronous with the pulse, and could be checked by pressure upon the common carotid, or upon firm pressure deep behind the jaw. The collapse of the sac after the incision suggested to me the propriety of resorting to local compression as a promising means of relief. A small pledget of cotton, with a thread attached, was pushed down to and as far as possible over the swelling. This was well borne, and somewhat abated the troublesome noise. However, Mr. C—— could not remain longer in St. Louis, and returned home, being instructed to persist in the compression as well as he could, moistening the cotton with glycerate of tannin, and to avoid violent muscular exercise, especially that of lifting, or any similar strain. I feared that a rupture of the sac might take place.

Later in the year his family physician wrote me that the noise persisted, and was sometimes so annoying as to prevent sleep. I stated, in answer, that ligature of the carotid was the alternative, though I thought probable, from the site of the aneurism, that there might be a collateral circulation, and that the noise would return.

Mr. C—— did not revisit me until March 16th, of this year. His condition was about as formerly, except that the pulsating noise had become less troublesome. The sac was of a whitish color, and decidedly thickened. It seemed also to be flattened, though the membrana tympani could not be seen. It was about the size of a split pea. He had persisted in the use of the compress and glycerate, and felt satisfied with results. H. D. R. $\frac{2}{3}$, L. o.

It is to be regretted that the affairs of Mr. C—— would not allow him to remain under treatment until the compression plan had been fairly tried. Of course his own efforts could not be completely effective. I had in mind electrolysis, and, as a last resort, the ligature. From the thickened condition of the sac as it last appeared (due to the treatment), the danger of rupture may be considered as less imminent, if not entirely removed.

THE GLOSSOGRAPH.

AUTOMATIC STENOGRAPHIC MACHINE FOR THE MECHANICAL TRANSCRIPTION OF HUMAN SPEECH.

THIS instrument is the invention of Amadeo Gentilli, and its object is the automatic transcription, in the form of an easily translatable record, of the human speech at its ordinary rate of utterance.

The operation of the instrument is a directly mechanical one, and in this connection it is interesting to consider that the first experiments which have resulted in its perfection were in process coincidentally with the experiments in this country which have given us the telephone and the phonograph.

The first instrument for graphic record of vocal sounds was the phonautograph of Leon Scott, 1832, consisting of a bell-shaped mouth-piece closed at its smaller opening by a membrane carrying a pen which recorded the movements of the membrane, in response to the human voice, upon a blackened cylinder rotated in front of it. This instrument was improved by Helmholtz, and later by Mr. Marey, of the Massachusetts Institute of Technology; it recorded the component musical tones of the voice, a transcription valuable in science, not in the ordinary affairs of life. Edison went a step farther, — made the record give back its movement to the membrane and reproduced the sound, but in neither instrument was the record legible. The acoustic method, therefore, it is evident, would not answer the proposed purpose, and, indeed, the experiments of Gentilli were from the beginning made in the direction of the mechanical solution of the problem, — a problem exceedingly difficult and complex at first sight, and the solving of which should meet the challenge of the prophet, "Who shall record the speech of a man?"

In analyzing speech the use of the terms vowels and consonants is to a certain extent misleading, since the impression is permitted that the vowels alone have tone or voice, while the consonants are

toneless or voiceless, which is by no means the case. Only the closed consonants *bp*, *gk*, *dt*, and the contraction consonants *ch*, *sch*, *f*, *ss*, are voiceless, while in addition to the vowels *l*, *m*, *n*, *r*, *w*, and soft *s* are vocal. By closed consonants is understood the explodents where the firm closure of the speech cavity is suddenly overcome by the pneumatic pressure of the accompanying vowel sound; and by contraction consonants, those in which the air finds a continuous escape through a narrow passage, such as that formed between the tongue and sides of the mouth, or between the lips.

The task set before the inventor of the glossograph included, firstly, the analysis of speech, not according to its sound but according to the purely mechanical conditions or situations in the mouth cavity during its production; secondly, the elimination from his scheme of such of these situations as were not absolutely necessary for transcription; and thirdly, the mechanical device for transcribing.

In the words of the inventor: If we first of all set aside those delicate distinctions, those fine shades of speech, which accompany all languages and their dialects, and which, however interesting they may be to the student of language, are merely that additional weight upon the pen of the writer which the newer orthography is striving to throw aside, the alphabet may be very much reduced and still fulfill all barely practical uses.

If, for instance, we regard *b* and *p*, *g* and *k*, *d* and *t*, merely as different degrees of intensity of one and the same sound, as is actually the case; if we represent *x*, *c*, *z*, *q*, by their proper components *ks*, *ts*, and *kw*, and estimate *ch* and *sch* at their proper value as simple sounds, and consider that between *f* and *v* there is no natural, phonetic difference but merely a conventional orthographic one, and that *w* is merely a sounding modification of *v*, — the elementary sounds are reduced to *ch*, *r*, *g*, — *sch*, *l*, *s*, *t*, — *e*, *i*, *a*, *o*, *u*, — *f*, *b*, — *m*, *n*, — and an aspiration sound *h*, which is in fact no sound properly but an intense, inarticulate, toneless passage of air.

The speech sounds are arranged in the above order in reference to the articulating surface to which they belong, differing individually only in the degree of closure of the mouth cavity, the degree of apposition of the opposing surfaces. For example: *ch*, *r*, *g*, are formed by the back of the tongue.

Sch, *l*, *s*, *t*, are formed by the tip of the tongue ; in *s*, *t*, the tongue being farther forward than in *sch*, *l*.

F, *b*, are produced by the lips.

M, *n*, by the nose.

The vowels *e*, *i*, *o*, *u*, are accompanied by a narrowing, and correspondingly a lengthening, of the whole mouth cavity. With *e*, *i*, the whole tongue, with *o*, *u*, only the back of the tongue, is raised, and the lips approximated. With *a*, the mouth cavity and lips are most widely opened.

L differs from *t*, in that with *t* the lateral closure of the mouth cavity is complete, while with *l* the air finds an escape between the sides of the tongue and the cheeks.

From this short review it will be seen that the inventor was enabled to concern himself, for purposes of transcription only, with those movements which take place in the median plane of the mouth — in other words, he determined the mechanical equivalents of speech in the most accessible part of the speech cavity, and then proceeded to use it to work his recording machine.

N and *m* differ from the other consonants in that in their production the soft palate drops and allows the air to pass out through the nose, instead of through the mouth. Furthermore, they are distinguished from each other mechanically by the fact that for *m* the lips are closed as in *b*, and for *n* the tongue takes the same position as in *t*.

The articulation movements may then be very simply classified as follows : —

Lifting of the back of the tongue, *ä*, *ch*, *r*, *g*, *o*, *u*.

Lifting the tip of the tongue, *ë*, *sch*, *l*.

Lifting the whole tongue, *ä*, *e*, *i*.

Pushing tip of tongue forward, *s*, *t*.

Lifting lower lip, *o*, *u*, *f*, *b*.

Sinking under lip, *a*.

Sinking upper lip, *f*, *b*.

Expulsion of air through nose, *n*, *m*, with accompanying tongue and lip movements.

The first attempt to record these movements was by means of

electric contact points within the mouth, — the apparatus consisting of a false palate of gutta percha having metallic discs set in its under surface, these discs being, when the palate was in place, opposite corresponding metal contacts on the surface of the tongue and lips, the accompanying wires being carried out between the teeth, and conveying the current passed, through apposition of the metallic surfaces, to the recording machine ; it was found, however, that the fluids of the mouth soon impaired the perfection of contact, and so the working of the apparatus.

The second experiment therefore carried the electric contact surfaces outside of the mouth, the work being done by movement of small levers ; and, while this apparatus answered its purpose more perfectly, it showed, what was still more valuable, that the transcription could be done by purely mechanical means alone.

The perfected glossograph, therefore, consisted of a series of light arms, or levers, passing into the mouth, resting lightly in contact with the parts whose movements were to be recorded, and communicating these movements to a corresponding series of slide bars set in the frame-work of the machine, and in their turn moving pivoted arms, carrying at the farther end of each a pencil, the pencils having a motion at a right angle to the automatic movement of a strip of paper on which their record was made.

To record the expulsion of air from the nose accompanying the *m* and *n* sounds, a more elaborate arrangement was required on account of the slight motive force exerted by the expelled air. In front of the nostrils, and attached to a light lever, were two discs or fans, upon which the expired air impinged ; the movement of these fans was communicated to the armature of a small electro-magnet, also set in the frame-work of the machine, and so to a corresponding lever and pencil ; there being six levers and six pencils drawing parallel lines on the paper, the curves, resulting from a combination movement of any two or more pencils, could be read across the lines, and translated accordingly ; the inventor of this ingenious instrument claiming that the reading of the record is soon easily acquired.

CLARENCE J. BLAKE.

EMPLOYMENT OF CALCIUM SULPHIDE IN THE TREATMENT OF INFLAMMATORY AND SUPPURATIVE AURAL DISEASE.

AURAL SERVICE OF DR. SAMUEL SEXTON, NEW YORK EYE
AND EAR INFIRMARY.

REPORTED BY ADOLPH RUPP, M. D., ASSISTANT SURGEON.

THE following cases of inflammatory and suppurative disease of the ear are selected from the records of the aural clinic at the infirmary as fairly representing Dr. Sexton's treatment in such cases. They were presented during their progress to the students in attendance at the school of the institution, and in part served as the basis of Dr. Sexton's remarks in the department of "Clinical Otology." The principles on which the management of these aural complaints is based have been already published and publicly discussed, and they need not, therefore, be dwelt upon at any greater length than needs occur in detailing the cases here reported.

In comparing Dr. Sexton's method with old routine plans pursued in the treatment of such cases as these are, it may be well to bear in mind the following, from Marshall Hall's essay, "On the Nature of Inflammation:" "It is well known that blood-letting is better borne in inflammation than in other diseases, and in inflammation of serous membranes and the parenchymatous substance of organs than in inflammation of mucous membranes. This fact has become of great value." And of great value, especially, it would appear this *fact* must be in the treatment of aural disease, since, as is known, the ear in structure is unlike "the parenchymatous substance" of other organs, and that its canals and chambers are lined with mucous and dermal membranes. And as for leeches, an eminent English authority—I believe no less a person than Sir James Paget—is quoted as saying of them, that they are very intelligent little animals

in that, when applied for pathological reasons, they succeed in abstracting the good, and not the bad, blood.

This method, however, by no means entirely discards local treatment; but he maintains that much more successful results can be obtained where remedies are also employed in meeting any remote or constitutional causative influences which may be found to exist.

CASE I. *Otitis Media Purulenta with Periostitis Externa* (following the Use of a Catarrh Snuff(?)).—John C—, aged thirty-three, oysterman, presented himself at the clinic, February 20, 1882. Believes he contracted syphilis four years ago by striking a man in the mouth. He has naso-pharyngeal catarrh. Three or four weeks ago, while inhaling some catarrh snuff, he experienced a disagreeable sensation in the left ear. Subsequently—nine days later—the ear was the seat of pain for two days, when a discharge commenced, which still continues. He has been using sweet oil dropped into the ear.

There is now periostitis of the external auditory canal and in front of and back of the ear. Owing to the swelling in the latter region, the left auricle projects abnormally. The canal has a red, glazed appearance, and its inner portion is filled with pus. A perforation whistle establishes the existence of a perforation.

Examination of the right ear shows the inner end of the canal to be red; the drum-head is lustreless, the short process prominent, and the superior quadrant congested.

Treatment.—The purulent collection in the left ear was removed by gentle syringing with warm water. Calcium sulphide, in one-half grain doses, was given every four hours. Aconite, in small doses, was to be continued while pains lasted. Rest and better hygiene recommended.

March 2d. The improvement was rapid, and the patient is now found to be free of periostitis; the perforation has healed, and the left ear no longer discharges; the drum-head (left) is whitish in appearance, lustreless, and thickened.

Treatment discontinued.

March 13th. Complains of pain in the right ear and in the chest. No hyperæmia of the ear exists. His teeth being in a bad condition, he was recommended to consult a dentist.

CASE II. *Otitis Media Purulenta Acuta of the Left Ear, and Facial Neuralgia on the same side.*—Samuel W—, native of England, aged twenty-four, medium in size and stout for his age, plethoric, and given to irregular and intemperate habits. He is a musician, playing a wind instrument. On the 17th of April Dr. Sexton saw the patient for the first time, when he stated that three weeks previously his left ear became painful and discharged. For several months past he has suffered from frequent and severe attacks of nasal catarrh

and neuralgia of the left side of the face. The nasal catarrh is, at the present time, very distressing, and the mucous membrane of the visible pharynx is found to be much thickened. The left canal was observed to be very large; the drum-head had a fleshy look, and was perforated in the anterior inferior segment. There is tinnitus; and when he plays on the flute the notes are heard autophonously, and seem double.

Treatment. — *Acidum boracicum cum calendula* (in powder), blown by insufflator into the external auditory canal; calcium sulphide, in one half grain doses, administered every two hours the first day, and afterwards less frequently. To rest from his work, and live more temperately.

April 20th. The discharge is less, there is no pain, and the hearing has greatly improved. Altogether, the improvement exceeds all expectation. The drum-head shows no perforation, but has a thickened appearance. The calc. sulph. to be continued.

May 4th. Patient reports himself as being "cured." Sound is again natural to him. All pain and abnormal noises are gone. He now hears a low voice, whereas, when he first applied for relief, he could only hear a loud voice in the (left) affected ear. The canal is dry.

CASE III. *Otitis Media Purulenta Acuta Binauralis, with consecutive Furunculosis.* — M. H., tailoress, aged forty-six, very much run down, applied for relief on April 23d. About a week ago was taken with a severe cold in the head, and a day or two later had a continuous and severe pain in the right ear and across the forehead, which deprived her of rest at night. Since yesterday both ears pain her. Tinnitus in right ear since it began to pain, and in the left ear since yesterday, described as a saw-mill noise and thumping. When she speaks, her words seem to her as coming from behind a wall, or muffled, as though spoken through a veil. She has been giddy for the last four days. On awaking this morning she could hear nothing, but now hears an ordinary voice in both ears. The left canal is denuded. The inferior segment of the drum-head, as much as can be seen of it, is red; the superior segment is bulging. The right drum-head is red and bulging superiorly.

Treatment. — Rest; one half grain calcium sulphide pill every two hours, and aconite, in small doses, to ease the pain.

April 28th. Giddiness is much diminished; sleeps during the night; autophony still present; pain is slight, and at times absent. She feels the left ear to be the one most affected, and with it she hears an ordinary voice, and, excepting a dull heaviness, she complains of no pain in this ear. The superior segment of the left drum-head bulges, the inferior segment being hidden from view because of some inspissated cerumen in the canal. The right drum-head is less red, and clearing. The right canal is dry.

Treatment continued.

May 1st. Last night the left ear began to discharge. The left canal is filled with muco-pus. The calcium sulphide pills continued.

May 4th. Though the right drum-head is still somewhat red, it is clearing, and the short process has become visible. The left canal is contracted at its inner extremity, and is filled with inspissated pus. Calcium sulphide continued.

May 8th. Complains of very acute pain in the left ear, and examination discovers a furuncle in the posterior wall of the left canal.

Treatment.—Hepar sulph.,¹ one fifth of a grain, given in place of calcium sulphide, and aconite in minute doses.

May 11th. Pain little complained of, and the tinnitus absent from the left ear. There are several furuncles in the left canal. Treatment of May 8th continued.

May 15th. Now and then she feels a darting pain going from the ear to the throat. There is no other pain, nor is there any discharge from the ear. The drum-heads of both ears are clearing, but reddish and dry-looking. No perforation discoverable in the left drum-head. Both canals quite clear.

CASE IV. *Suppurative Inflammation around the Ear finding Exit through the External Auditory Canal.*—Richard S—, aged twelve, school-boy, first presented at Dr. Sexton's clinic on May 1st, and gave the following history: Is subject to frequent naso-pharyngeal catarrhs; has naso-pharyngeal catarrh at present. Six years ago had double otalgia, which was soon followed by a scanty discharge from both ears, since which time he hears with more or less difficulty. At present he complains of an intermittent pain in and around the left ear, and, since April 25th, of a buzzing noise in this ear. Lately he has been suffering much from toothache. His teeth are in a bad condition, especially the molars, which are carious. There is considerable irritation of the left lower gum noticeable. The entrance of the left auditory canal is closed, and the concha is swollen. The auricle stands away from the head abnormally, due to the swelling back of the ear, and this swollen condition exists all around the ear, which is painful and tender, but not red. The right canal is humid at its inner extremity, and exfoliating. The right drum-head is hyperæmic and thickened.

Treatment.—Rest; was advised to go to a dentist; and a one half grain calcium sulphide pill every three hours was ordered.

May 4th. Concha and circumauricular region seem to be somewhat more swollen than was the case several days ago, but there is no increase of redness. Left auditory canal is almost closed.

Treatment.—Hepar sulph. in one fifth grain doses, and aconite in small doses. The importance of having his teeth attended to was again impressed on his mother, because he has not yet consulted a dentist.

May 8th. On the 6th of May a "thick" discharge came from the left auditory canal, whereupon followed the disappearance of the swelling around the ear. Left canal is now filled with inspissated pus. The canal is wider, and

¹ Hepar sulphur differs from calcium sulphide: the former is made by roasting burned oyster shells with sulphur, while in the latter pure lime is employed.

hyperæmic at its inner end. A pouting point on the anterior superior wall of the canal, beyond the central portion, marks the point through which the pus in all probability came. Examination shows that it did not come from the tympanic cavity. Left ear hears a low voice. He is recovering rapidly.

CASE V. *Otitis Media, Catarrhalis Acuta, Ozana, Periostritis Externa.*—Rosa N—, aged thirty-eight, and in the fifth month of pregnancy, was seen by Dr. Sexton on May 1st. She complains of pain in both ears and pain over the orbital and temporal regions, and of pain extending down the neck and back whenever she attempts to move her head. These troubles began two months ago, the right ear being first affected. The pains are often so severe as to deprive her of rest at night. She has a dry naso-pharyngeal catarrh, and has had a bad-smelling discharge from the nose for more than eight years. Most of her teeth are gone, and she has been wearing a vulcanite plate for four and a half years, which irritates the mouth. The right drum-head is considerably inflamed about the superior anterior quadrant, and less in the posterior segment. The malleolar blood-vessels are enlarged, and the membrane, as a whole, is dusky and dull. The inner end of the left external auditory canal is red, and the anterior superior quadrant of the drum-head is red and inflamed. There is much tenderness over the left mastoid region, and also in front of the tragus.

Treatment.—She was advised to give up using the vulcanite plate; and was prescribed a one half grain calcium sulphide pill every two hours, aconite in minute doses, and was told to rest.

May 4th. General condition is much improved, sleeps better, and the pain is almost all gone. The appearance of the drum-heads is much improved. She can now move her head with less pain.

CASE VI. *Otitis Media Purulenta Chronica with Post Aural Abscess.*—Thomas D—, aged five and a half years, was first seen at the clinic on May 8th. Of late has suffered from naso-pharyngeal catarrh, the attack dating back some six months. Previously his health had been excellent; he had never been observed to have even a slight cold in the head. About this time (six months ago) his left ear began to discharge, having been preceded by slight tenderness; it was never really painful. The discharge, which had been profuse, ceased suddenly two weeks ago; and what is now a soft, fluctuating, pinkish colored swelling over the mastoid region, and above the auricle, began to develop. This swelling is now free of tenderness, does not pit on pressure, and causes the auricle to stand out prominently from the head. His general appearance is now suggestive of a scrofulous taint.

Examination of the ear shows the upper segment of the left drum-head only, which looks lustreless and dry.

Treatment.—While the patient was before the class the abscess was opened with a knife, the pus evacuated, and a tent placed between the edges of the wound without being rammed down into the tissues. One tenth of a grain of calcium sulphide was ordered every three hours.

May 11th. The swelling above and behind the ear has not decreased in size, the wound is still open, and compression of the swelling causes a discharge of pus through the wound. The patient experiences no suffering apparently, but it is decided to give freer exit to the pus by enlarging the opening. Calcium sulphide continued.

May 18th. The swelling has almost entirely disappeared, and the parts are rapidly resuming a normal condition. Patient discharged.

In transcribing these cases from the records kept at Dr. Sexton's clinic, the reporter has not selected the few here presented as representing the most favorable results of the action of the sulphide of calcium in inflammatory and suppurative affections of the ear, but he has taken them at random, as more truly representing the general results of treatment. They are necessarily divested here of many of their interesting features as illustrative of diagnosis, prognosis, etc., features of particular interest in instruction. The irregular attendance of patients, and their absence when a cure is near, deprives the charity patient of the interest pertaining to the well-to-do; and, when it is considered that in nearly all of the cases the remote causes, as dental and nasal diseases, are scarcely ever entirely within the control of the physician, the reported result must be taken as pointing out the path to be pursued rather than as illustrating complete success.

The calcium sulphide used was put up in gelatine-coated pills, several satisfactory preparations of which may now be obtained. The boracic acid and caludula powder employed has been described in a paper by Dr. Sexton, published in the *New York Medical Record*, December 31, 1881. It may be obtained of Messrs. Caswell, Hazard & Co., New York.

Reviews.

ACOUSTICAL OBSERVATIONS, IV. LORD RAYLEIGH. *Philosophical Magazine*, May, 1882.

(a.) *Pitch of Organ-Pipes.* In 1877 the author showed that the note of an open organ-pipe, when blown in the normal manner, was higher in pitch than the natural note of the pipe considered as a resonator. The note of maximum resonance was determined by putting the ear into communication with the interior of the pipe, and estimating the intensity of sounds of varying pitch produced externally.

The present paper describes the results obtained by applying the more accurate method given by Blaikley (*Phil. Mag.*, May, 1879), in which the external sound remains constant, and the adjustment is effected by tuning the resonator to it.

A shortened two-foot metal organ-pipe was furnished with a paper slider, by which its note of resonance could be somewhat varied. A tuning-fork giving, as measured, two hundred and fifty-five vibrations per second, was kept in motion by electricity, and placed at a moderate distance from the lower end of the pipe. The resonance of the pipe was observed from a position near the upper end, and the paper slider was adjusted to the position of maximum effect. It was found that this could be done with considerable accuracy, as in fourteen measurements the extreme range was only one fifth of an inch, which corresponds to about two vibrations per second out of a total of two hundred and fifty-five. The slider was fixed at the mean of these positions, and the natural note of the pipe was then considered to be two hundred and fifty-five. The error in length was probably less than one twentieth of an inch, and the error in pitch less than half a vibration per second.

The pipe was then blown from a well-regulated bellows, and its pitch determined by counting its beats with the fork referred to. At wind-pressures between 4.2 inches, and 1.58 inches the pitch of the pipe was well defined, and considerably higher than the natural note. Below one inch the pitch became unsteady; at about 0.8 inch the pitch of the pipe fell to unison with the natural note, and with lower pressure became the graver of the two. A table of results accompanies the paper.

(b.) *Slow versus Quick Beats for Comparison of Frequencies of Vibration.* Rayleigh considers that when the sounds are pure tones and well sustained, it is ad-

visible to use beats much slower than four per second, the number most commonly chosen as the best. With slow beats, and using special precautions, the whole number of beats in the period of observation may be fixed to within one tenth or one twentieth of a single beat. Rayleigh refers to some experiments performed in connection with Dr. Schuster (*Proceedings Royal Society*, May 5, 1881, p. 137), in which, by the use of a resonator, beats having a period of as much as twenty-four seconds were readily observed.

(c.) *Estimation of the Direction of Sounds with one Ear.* An account is given of experiments performed upon an observer deaf on one side, similar to those described in a former paper (*Philosophical Magazine*, June, 1877). Mistakes were made which would be impossible for normal ears, such as confusing the situation of voices, and of clapping of hands when to the right or left as well as when in front of or behind the listener.

(d.) *A Telephone Experiment.* Attention is called to the diminution of induction with the telephone when a plate of thick copper is placed between the primary and secondary circuits.

(e.) *Very High Notes. Rapid Fatigue of the Ear.* In experimenting with high-pitched bird calls, it was found that the ear rapidly becomes deaf to sounds of high pitch and moderate intensity. A very short intermission, even a fraction of a second, suffices for a partial recovery of the power of hearing. The actual continuity of the sound can be demonstrated by its action upon a sensitive flame. It is possible to determine the wave-length of the sound by means of the sensitive flame in the manner described in the *Philosophical Magazine* for March, 1879, p. 154. Almost identical results were obtained from observations of the loops, where the flame is most affected, and from the nodes, where it is least affected.

(f.) *Sensitive Flames.* Lord Rayleigh has investigated the cause of the fact noticed by Tyndall, that a partially closed stop-cock in the gas-pipe largely destroys the sensitiveness of a flame. Rayleigh inserted a manometer on a lateral branch near the flame, and also placed two stop-cocks in the path of the gas, one close by the manometer, the other separated from it by a long rubber tube. When the first cock was fully open, and the flame brought near the flaring point by the adjustment of the distant cock, the sensitiveness to external sounds was great, and the manometer indicated a pressure of ten inches of water. But when the distant cock stood fully open and adjustment was effected at the other, high sensitiveness could not be attained, since the flame flared without external excitation, while the pressure was still an inch short of that which had readily been borne in the former arrangement. On opening again the neighboring cock, and adjusting the distant one, until the pressure at the manometer measured nine inches, the flame was found to be comparatively insensitive. The cause of the prejudicial action of partially opened stop-cocks is not so much that they render the flame insensitive as that they induce premature flaring. This seems to be due to the

production in the cock of sonorous disturbance of the kind to which the flame is sensitive, which is propagated through the tube to the burner. A pinch-cock can be used for adjustment near the flame with impunity. Mere irregularity of flow produces no marked effect, provided that no sound attends it. C.

DETERMINATION OF THE POSITION OF LOOPS IN TUBES BY THE USE OF MANOMETRIC FLAMES. (*Determination des Ventres des Tuyaux Sonores a l'Aide des Flammes Manométriques.*) A. HURION. *Journal de Physique*, March, 1882.

The author uses a manometric capsule connected with a very fine tube, which is inserted into the organ-pipe, this being sounded in a horizontal position. The flame is viewed in a revolving mirror, and the tube moved until the sensations disappear. The method is found to be a delicate one, a displacement of a few millimeters causing a reappearance of the sensations. The method can be applied to stopped pipes by piercing a hole in the closed end, but the results are less clear. C.

ON SOUND SHADOWS IN WATER. JOHN LE CONTE. *Silliman's Journal*, January, 1882. *Philosophical Magazine*, February, 1882.

The paper first considers briefly the relations between optical and acoustic shadows, and the differences arising from the great length of sound-waves as compared with those of light, and then proceeds to give an account of an investigation of the phenomena of acoustic shadows observed in water, in which liquid these shadows are more sharply defined than in air. The observations of Colladon are almost the only ones bearing upon the subject, and even these are very fragmentary.

In 1874 the author of the paper executed a series of experiments in the harbor of San Francisco, producing sonorous waves in the water by the explosion of cans containing each about fifteen pounds of dynamite. Remarkable effects were produced by the sudden shock imparted to the water. At a distance of three hundred feet or more from the detonating cartridge, two distinct shocks were experienced, one coming through the water, so that it was felt as a short concussion, before any sensible elevation of the column of water was noticed; and the second (which was heard), coming through the air, a little later. The first shock was felt by a person sitting in a boat three hundred feet away, as a sudden blow applied to the soles of the feet, which were resting on the bottom. In fact, it drove out the oakum from the seams in the bottom of the boat.

It was found that with sound-waves thus produced the shadows were very strongly marked, so that when the observer stood upon a pile and lowered two stout soda-water bottles, one in front of the pile, the other in its geometrical shadow with regard to the exploding cartridge, the former was always broken by the shock, the latter never injured. Also, when stout glass tubes, six feet long, and one and a half inches in diameter, were covered with layers of cartridge-

paper, to prevent loss of fragments, and then lowered so as to rest horizontally, the middle portion being in the geometrical shadow of the pile, breakage occurred only at the ends which were outside of the shadow. This action took place even as far back as twelve feet behind the pile, showing the shadow to have very sharply-defined boundaries. Just before the gases from the explosion raised the water, curious jets of water were seen to rise to a height of about three inches.

The greater distinctness of sound-shadows in water would, on theoretical grounds, seem to arise from a shorter wave-length in that medium; especially, as Rayleigh has shown, that in air the shadows produced by acute sounds are more definite than those produced by grave sounds. With continuous sounds, for any given pitch, the wave-length in water must of course be about four times the wave-length in air, on account of the greater velocity of sound in water. But in the case of a wave produced by a sudden blow, the wave-length must be determined by other considerations than those of musical pitch. It is difficult to estimate the wave-length in such cases; but if L = wave-length, t = time of generating impulse, v = velocity of sound in water, L varies as $t \times v$. Hence, L is less as t is less, and must be very short in the case of a sudden blow.

The author explains on this hypothesis the observations of Colladon on acoustic shadows in water, as well as his own. In Colladon's experiments, the brief sound of the hammer was alone transmitted to a distance, and not the ringing of the bell, as a whole. The process of surface-blasting is a sufficient evidence of the brevity of the shock from exploding dynamite.

Dynamite explosions in air also apparently give rise to sharply-marked acoustic shadows, and an interesting illustration of this is cited in connection with the accidental explosion of a large quantity of a nitro-glycerine compound near San Francisco.

C.

BEITRAG ZUR PHYSIOLOGIE DES OHRES (*Contribution to the Physiology of the Ear*). DR. HESSLER, *Archiv f. Ohrenheilkunde*. XVIII. 4. p. 227.

Hensen states in his *Physiology of the Organ of Hearing* (Hermann's Handbuch d. Physiol. III. 2. p. 26), "that when the vibrations of a tuning-fork held close to the ear cease to be heard, the tone will again be perceived by applying the instrument firmly against the teeth. If it ceases again, closure of the meatus will reproduce the sound in the ear which is closed, and if the sound is again lost, it reappears by inserting the handle of the tuning-fork in the meatus." Hessler has repeated these experiments, and reaches a conclusion entirely different. If the tone of a tuning-fork held between the teeth has entirely ceased, it can be heard about one minute longer when held close to the ear. On referring to Rinne's communication in *Prager Vierteljahrsschrift für praktische Medicin*, I. 1855. p. 72, upon whose authority Hensen's statement was based, Hessler found that the facts reported by Rinne were directly opposite to the opinion which had been reported of him, and his own experiments confirmed the original statement of Rinne.

By these investigations he was led to determine how long the tone of a vibrating tuning-fork can be heard from different parts of the cranial bones, as compared with aerial conduction. For this purpose tuning-forks c , c' , c'' , c''' and c'''' , of 128, 256, 512, 1,024, and 2,048 v. s. respectively, were used, and their length, breadth, and thickness were carefully determined in order to avoid different results in case the experiments should be repeated.

The tuning-fork c''' was soon discarded for the experiment on account of the short duration of its vibrations, especially when brought in contact with solid bodies like the teeth.

Four series of experiments were made. In the first the tuning-fork, moderately struck at its end, was held between the teeth, until the tone had disappeared, then applied to the ear, until there it also had vanished, and the relative duration of the sounds carefully registered.

In the second series the tuning-fork was first applied to the teeth, and then inserted by its handle as deep as possible in the meatus, and here also the time was accurately determined.

The third experiment consisted in applying the tuning-fork to the teeth, and immediately on the cessation of the sound, plugging the meatus with cotton, and noting the time in which the sound had reappeared.

In the fourth experiment the tuning-fork was first held close to the ear, and then its handle inserted as deep as possible in the meatus, and again the time noted when the sound was heard.

The result of his experiments is as follows :—

I. TUNING-FORK $c = 128$ v. s.

1. With tuning-fork in the meatus the tone was heard 21–24" longer than through the air.
2. Through the teeth and plugged meatus, 10–11" longer than through the teeth.
3. Through the air, 13–15" longer than through the teeth.
4. With tuning-fork in the meatus, 23–25" longer than through the teeth.

II. TUNING-FORK $c' = 256$ v. s.

1. With tuning-fork in meatus equally long as through the air.
2. Through teeth and plugged meatus, 37–39" longer than through the teeth.
3. Through the air, 65–67" longer than through the teeth.
4. With tuning-fork in meatus, 67–69" longer than through the teeth.

III. TUNING-FORK $c'' = 512$ v. s.

1. Through the air, 20–22" longer than with tuning-fork in the meatus.
2. Through teeth and obstructed meatus, 11–13" longer than through the teeth.
3. With tuning-fork within the meatus, 39–40" longer than through the teeth.
4. Through the air, 55–60" longer than through the teeth.

IV. TUNING-FORK $c''' = 1,024$ v. s.

1. Through the air, 24–26" longer than with tuning-fork within the meatus.
2. Through teeth and plugged meatus, 9–10" longer than through the teeth.

3. With tuning-fork within the meatus, 13-15" longer than through the teeth.

4. Through the air, 33-35" longer than through the teeth.

The figures here used are those obtained in the experiment with the left ear of the observer, which he considers normal. For the right ear there is a difference of about 2" less, all through the experiments.

It is remarkable that, while with tuning-fork $c = 128$ v. s. the tone was heard 21-24" longer when the tuning-fork was held in the meatus than through the air, there was no difference with $c' = 256$ v. s., and with $c'' = 512$ v. s. and $c''' = 1,024$ v. s. the ratio became inverse, the tone being heard longer through the air than with the tuning-fork in the meatus.

It was proved during these experiments that the vibrations of a tuning-fork cease sooner when it is struck in the middle than when struck at the ends; that with a uniform striking force the duration is constant and increases in proportion to the force wherewith it is struck; and further, that with equal striking force the duration of the vibrations of c' corresponds nearly with that of c'' , and that of c with c''' , the duration of vibration in the latter group being only about one half that of the former. In the use of the tuning-fork for bone-conduction it is better to strike the fork moderately than hard, for in the latter case the tuning-fork produces in addition to its fundamental tone also the octave and a buzzing noise in the head, by which the localization of the sound becomes very much disturbed.

Hessler believes that the methods for examining the hearing power now in use might be modified in accordance with the result of his experiments.

1. In the first place, the tuning-fork must be applied to the teeth, until it ceases to sound; then to the ear, and the period during which it can again be heard there must be carefully noted. A comparison of the duration of this period with the normal will give the degree of loss of hearing.

2. The tuning-fork, being struck with the same force, is inserted in each of the external auditory canals, and allowed to remain until no more sound is perceived. If one ear be normal, and the hearing power of the other be less, it will cease to sound sooner in the affected ear. If both ears are affected, the duration of the relative sound in each must be compared with that of a perfectly normal ear.

3. The tuning-fork is first held against the teeth, and when the sound ceases the meatus is artificially closed. This, as above stated, causes it again to be heard for a certain period. If an obstacle is already present, before this artificial obstruction is made, the duration of the restored tone will not reach the normal point; in fact, the presence of this primary obstruction will already have increased the duration of the sound while the tuning-fork was held to the teeth.

The author intends to test these suggestions in his own practice, and to make further communication of his results.

Finally, it must be observed that the higher the tones, the more the bone-conduction falls below the aerial conduction, and due caution in this respect is therefore necessary in the use of the tuning-fork for diagnosis.

Urbantschitsch has made the observation that in perception of sounds of small intensity, variations often occur, — and that these variations are independent of pulsation or respiration. Hessler has confirmed this observation in another series of experiments. For this series he used two soft rubber tubes, each one hundred centimetres long, connected at one end through a T-shaped glass tube. At the foot of the T was attached another rubber tube of the same size, and fifty centimetres long, and its free end was provided with the pectoral end of a stethoscope three centimetres wide, to serve as a sound-receiver. This latter part of the apparatus could be firmly held in a wooden frame at any distance perpendicularly above the sound-producing body. The latter was a watch, resting on a thick layer of cotton, and this again upon a soft rubber tube closely rolled together, so as to exclude, as much as possible, the influence of solid bodies as resonators. The ends of the rubber tubes intended for the ear were fitted to facilitate their insertion. If only one ear is used for investigation, one of the long rubber tubes is firmly tied in a knot.

The different experiments cannot well be rendered in extract, and should be read in the original. The general results are as follows : —

1. If with a certain small intensity of the sound-waves the ear commences to be excited, the sensation of hearing is not continuous, but greatly intermittent. Between the few seconds in which the sound is perceived there are pauses, during which nothing is heard. The more the sound increases, the shorter become the pauses, and the longer the period of reaction of the auditory nerve, that is, the perception of sound. But at the same time the subjective sound source changes its location. At first it seems to come from an infinite distance, drawing nearer and nearer to the ear, according to the intensity of the sound, then gradually vanishes again in the distance whenever the pauses occur. With louder sounds the pauses disappear entirely, and the hearing is more continuous, while the variations in intensity gradually decrease. The location of the sound in this stage is less subject to change. If the sound is very loud, the subjective source of the sound is located step by step further in the ear, the occiput, and corresponding side of the head, even to the forehead. If the experiment is reversed, the opposite order follows, with this difference, however, that now the hearing continues for some distance beyond the point where the sound was first observed in the first experiment. This observation, known to all otologists, is therefore, according to Hessler, a physiological fact, and not imagination on the part of the patient, as Von Tröltsch supposes. It finds its analogue in the continued excited condition of the retina for some time after withdrawal of a strong light.

2. These experiments prove, as already stated, the truth of Urbantschitsch's statement, that the variations observed in the perception of sounds of small intensity do not depend upon the circulation or respiration.

3. They explain the fact already stated by Wilde, that for subjective noises the prognosis becomes always more unfavorable when they are located in the

head than when apparently outside. For the experiments prove that this location in the head depends upon a high degree of irritation of the acoustic nerve.

The general results of his observations finally are in accordance with the later investigations of Urbantschitsch, published in the *Archiv f. Physiol.* 1881. Bd. XXIV. and XXV.

Helmholtz says in *Die Mechanik der Gehörknöchelchen und des Trommelfells* (*Archiv f. Physiol.* 1, pp. 42, 43): "If we take a tuning-fork which consists of a single piece of steel, and which therefore has nothing about it which can give a rattling sound, and, after having struck it forcibly, hold it near the ear so that the sound can be heard very distinctly, the character of the tone becomes sharp, and we hear distinctly jarring sounds, similar to what is heard in musical instruments when something is loose, or from a tuning-fork when pressed rather lightly upon a sounding-board. These jarring sounds result from the slight shocks which a vibrating body makes upon a body at rest, or vibrating in a different manner. These blows are repeated regularly and produce sound; but inasmuch as they correspond to an interrupted periodical movement, the sound possesses many overtones and is harsh in character. Such tones occur, as is well known, in the ear itself, as the result of very loud sounds. We can hear also from a B tuning-fork of 116 v. s. a jarring sound so distinctly that it resembles a buzzing in the ear. This jarring tone is very distinct and strong when the pressure of the air in the cavity of the tympanum is equal to or less than that of the atmosphere, and when the 'cogs' of the hammer and anvil are closely united; but it disappears when air is driven into the cavity of the tympanum, and the 'cogs' are consequently separated. I think, therefore, that we are justified in concluding that this jarring tone is caused by the 'cogs.'"¹

Hessler does not agree with this explanation on the following grounds:—

1. This jarring sound is not only heard when a tuning-fork forcibly struck is held to the ear, so that the sound-waves can be directly transferred to the membrana tympani and the ossicles; it appears just as well when the instrument is held in front of the observer, even with the meatus plugged. In this case the intensity of the sound-waves is certainly diminished, yet it is heard in both ears, because with the fundamental tone it has its origin in the vibration of the tuning-fork itself.

2. The timbre of the sound tells against the theory of Helmholtz. The sound produced by a movement of the hammer against the anvil corresponds with that caused by the rubbing of the finger-nails against each other. The jarring sound of the tuning-fork has a purely metallic character.

3. Similar sounds are observed in organ-pipes, apparently at the end of the pipe, and a change in its length changes the location. Hence, it cannot be formed in the ear, but it is apparently formed on the spot where the vibrating mass of air passes a body in a condition of rest.

¹ Buch and Smith's Translation, pp. 49, 50.

4. That the intensity of a tone does not necessarily involve the striking together of hammer and anvil can be observed with the harmonium. If a tone is forcibly sounded, the fundamental tone is heard with a series of overtones, sometimes so strongly as to cause dizziness. Yet no jarring sound is heard, even when the ear is brought very close to the sounded key.

5. If Helmholtz's opinion is the true one, patients who have lost either hammer or anvil, or both, cannot hear the jarring sound. Yet in a few cases of this kind where sufficient hearing yet remained, Hessler could convince himself that not only did they notice the jarring sound when it did occur, but also correctly stated when it ceased.

For all these reasons Hessler rejects the explanation of Helmholtz in regard to the origin of these sounds. He believes that they are produced by the difference in amplitude of vibration in the two prongs of the tuning-fork, and that the prong which is struck must have a greater amplitude of vibration than the one which is not struck. An experiment in which the prongs were made to register their own vibrations was not successful, probably because the tuning-fork had to be solidly fixed, Hessler having observed that the jarring sound is of less intensity, and of shorter duration when the tuning-fork is held firmly in the hand, than when lightly held.

J. J. B. V.

DISTURBANCES OF HEARING AND EQUILIBRIUM, RESULTING FROM EPIDEMIC CEREBRO-SPINAL MENINGITIS. (*Ueber Meningitis Cerebro-Spinalis Epidemica, insbesondere über die nach derselben zurückbleibenden combinirten Gehörs- und Gleichgewichtsstörungen.*) Moos. Heidelberg. 1881. 68 pp.

For the last eighteen years Moos has recorded the cases of the disease which he has seen in his practice, and now analyzes them in an interesting pamphlet of sixty-eight pages, discussing the ætiology, age, sex, various symptoms, complications with other diseases, sequelæ, etc.

Of the 64 cases, about 50 per cent. showed disturbances both of hearing and equilibrium; 38, or 59 per cent., were totally deaf in each ear, and consequently deaf-mute; 20, or 31.4 per cent., were totally deaf, but retained their speech at the time of the last examination; 1 only, or 1.5 per cent., came out of the disease with perfect hearing.

Those patients left with a hearing for the higher tones, but with a dullness or absolute deafness for the lower tones, according to Moos, stand a better chance for understanding speech than when the converse is found.

The staggering gait is referred by Moos to changes in the semicircular canals and their ampullæ.

As established facts, Moos gives the following :—

1. The centre of the sense of equilibrium is in the cerebellum.
2. The ultimate nervous apparatus in the ampullæ, possibly also in the sacculles, is in connection with this centre by means of nerves.

3. Disease or irritation of this ultimate apparatus, or of tissues in its neighborhood, may produce the same symptoms as a disease or irritation of the central organ itself. This is true of the symptom of dizziness.

4. Unilateral labyrinthine affections, whether they occur primarily or by extension of disease from the skull, manifest themselves by dizziness.

5. If in the same patient the other side becomes affected, the new disease begins with dizziness, and is followed soon by a staggering gait.

6. Unilateral sudden paralysis of the nerves of the ampullæ produces no dizziness.

7. The same rule holds good in regard to destruction of the nervous apparatus of the vestibule when it occurs in chronic disease.

8. Bilateral, acute, hæmorrhagic or purulent inflammation of the nervous ampullar apparatus, with permanent paralysis, especially when the result of cerebro-spinal meningitis, produces a long-continued staggering gait. Children, and those adults who have also trouble with the eyes, are affected more severely and for a longer time. As soon as the muscles and eyes become accustomed to acting independently, the staggering gait disappears.

For the treatment of the dizziness and staggering, Charcot's method, with quinine, was chiefly used; beginning with thirty centigrams, and increasing gradually, till one gram was taken daily. Quinine was used for one month; then the treatment interrupted for a fortnight, and then resumed again for another month.

ACUTE DESQUAMATIVE INFLAMMATION OF THE DRUM MEMBRANE. (*Ein Fall von acuter desquamativer Entzündung des Trommelfells.*) WETTE. *Monatsschrift für Ohrenheilkunde*, No. 2, 1882.

A man, thirty-seven years old, who had suffered as a child, and frequently afterwards from otorrhœa on the left side, was examined, and the drum membrane found to be firmly adherent to the promontory, but free from inflammation and discharge. Two months afterwards he had severe pain in that ear for two days, which was followed by purulent discharge, and inspection showed a grayish-white in place of the membrana tympani, together with a great diminution in the hearing, and the bone conduction increased on that side. Syringing being ineffectual in removing the mass, it was separated piecemeal by forceps, the inner layers showing distinct impressions of the irregular drum membrane. Beneath the mass was a small polypoid growth, which was removed. Applications of pulverized boracic acid relieved the inflammation in eleven days, and the previous condition was restored. Four months after exactly the same condition occurred again, was treated and relieved in the same way.

A microscopic examination of the masses showed them to be undoubted epidermoid formations, polyhedral cells destitute of a nucleus.

ATROPHY OF THE TEMPORAL BONE WITH MULTIPLE OPENINGS. BURKNER. *Archiv für Ohrenheilkunde*. XVIII.

In both temporal bones of a child three years old, the clinical history of which was unknown, the following abnormal openings, which have generally been considered arrests of development, but which, from the title of the paper, the author regards as atrophies, were found : —

The roofs of the tympana were extremely thin, and showed several slits and round openings.

Above the roots of the zygoma the squamous portion was extremely thin, and contained a number of fine perforations.

The posterior and upper wall of the carotid canals were perforated.

The fossæ jugulares showed openings several millimetres long, and, in addition, several fine openings.

The fossa sigmoidea of one bone was also perforated. The right bone weighed 6.2 grammes, the left 6.5 grammes, instead of the normal nine grammes.

SURGICAL OPENING OF THE MASTOID PROCESS. (*Casuistik zur chirurgischen Eröffnung des Warzenfortsatzes.*) SCHWARTZE. Zweite serie. *Archiv für Ohrenheilkunde*. Vols. XVI., XVII., and XVIII.

A second series of fifty cases, begun some time since, is now approaching completion, and, although the conclusions drawn from them have not yet appeared, a short notice of the cases is justifiable on account of their variety, number, and thoroughness.

No. 51. Otitis media purulenta chronica with abscess and fistula of the mastoid. Enlargement of the osseous fistula with gouge and hammer. Scraping of the mastoid antrum. Cure in ten months.

No. 52. Otitis media purulenta chronica with mastoid abscess. Opening of the mastoid antrum with gouge. Permanent cure in nine months.

No. 53. Otitis media purulenta acuta with mastoid abscess. Enlargement of the osseous fistula with gouge. Death, eight days after, from miliary tuberculosis.

No. 54. Otitis media purulenta chronica after scarlatina. Sinus-phlebitis. Metastatic pyæmia. Opening of the antrum with gouge. Death.

No. 55. Otitis media purulenta chronica with fistulous opening into meatus and inflammation of the mastoid cells. Perforation of the antrum with chisel. Cure in two months.

No. 56. Otitis media purulenta chronica. Fistulous opening into the corticalis of the mastoid with a healthy skin. Perforation with the gouge. Drainage. Cure in twenty-one months.

No. 57. Acute abscess in the mastoid cells without perforation of the drum membrane. Opening of the mastoid with the chisel. Cure in seven months.

No. 58. Central caries of the mastoid with fistula into the meatus. Perforation of mastoid with chisel. Cure in fifteen months.

No. 59. *Periostitis syphilitica chronica*. Perforation of mastoid with chisel. No evacuation of pus. Cure in nine months.

No. 60. *Otitis media purulenta acuta* with secondary periostitis and fistulous opening of the corticalis of mastoid. Multiple polypi in meatus. Perforation of mastoid with chisel. Cure in three months.

No. 61. *Otitis media purulenta chronica* for four years. Repeated abscesses on mastoid. Fistula into the corticalis. Enlargement and perforation of antrum with chisel. Cure in two years.

No. 62. *Otitis media purulenta acuta* with abscess on the mastoid and small fistula into the corticalis enlarged with the gouge. Cure in three weeks.

No. 63. *Otitis media purulenta chronica* with polypi and facial paralysis. Perforation of mastoid with the gouge. Subperiosteal abscess on mastoid. Subdural (?) abscess over the carious pyramid. Death from meningitis.

No. 64. *Otitis media purulenta acuta* with involvement of mastoid. Repeated incisions. Perforation with the chisel. Cure in nine months.

No. 65. *Otitis media purulenta acuta* with inflammation of the mastoid. Opening of the antrum by chisel. Cure in three months.

No. 66. *Scrofulous caries* of the mastoid. Perforation of the antrum with chisel. Cure in one year.

No. 67. *Otitis media purulenta chronica*. Purulent periostitis with superficial caries of mastoid. Scraping. Cure in four weeks.

No. 68. *Otitis media purulenta chronica* with abscess and fistula into meatus. Opening of antrum with chisel. Cure in six weeks.

No. 69. *Otitis media purulenta chronica*. Fistula in the mastoid enlarged with chisel. "Cholesteatomatous masses," which filled the antrum, scooped out. Cure in nine months with the persistence of a healed osseous fistula.

No. 70. *Caries necrotica* with fistulous opening of the mastoid: chiseled out in 1869 and apparently healed. Recurrence, after eight years, with facial paralysis and cerebral symptoms. Perforation of the mastoid with chisel. Death from diffuse purulent meningitis, the result of necrosis of the labyrinth, twenty-two days after.

No. 71. *Otitis media purulenta chronica*. Fistula in mastoid enlarged with chisel. Scraping of the mastoid cells and meatus. Cure in eight months.

No. 72. *Otitis media purulenta chronica*. Secondary periostitis of the mastoid with carious perforation of the corticalis. Opening of the antrum by chisel, with scraping. Drainage. Permanent healing in two months.

No. 73. *Otitis media purulenta acuta* with empyema of mastoid. Perforation of antrum by chisel. Cure in five months.

No. 74. *Otitis media purulenta chronica* with necrosis of mastoid. Extraction of the sequestrum with exposure of the dura mater. Cure. Death, thirteen months after, from tuberculosis of the lungs, the seat of operation having been cicatrized for a long time.

No. 75. Otitis media purulenta acuta with necrotic caries of the mastoid. Extraction of the sequestrum and enlargement of the fistula. Death in four weeks from pneumonia catarrhalis.

No. 76. Otitis media purulenta chronica with caries necrotica of the mastoid. Scraping. Death on twenty-fourth day from meningitis tuberculosa.

No. 77. Otitis media purulenta chronica duplex with caries of left mastoid for ten years. Perforation of the antrum with chisel and scraping. Drainage. Cure in two years.

No. 78. Otitis media purulenta chronica. Fistula in mastoid. Extraction of a sequestrum of the corticalis with enlargement of the osseous fistula by chisel. Scraping out of granulations. Drainage. Cure in two years.

No. 79. Otitis media purulenta chronica for seventeen years. Sudden symptoms of inflammatory irritation of the brain, with chills. Disturbance of speech. Subperiosteal abscess of mastoid with fistulous opening into the corticalis, which was enlarged. Drainage. Death, on the eighth day after operation, with symptoms of brain-abscess and purulent meningitis. No autopsy.

No. 80. Otitis media purulenta chronica with large abscess behind ear and a small fistula into the antrum. Enlargement of fistula. Drainage. Death on next day. No autopsy.

No. 81. Otitis media purulenta chronica for twelve years with a central caries of the mastoid. External bone healthy and perforated by chisel. Cure in one year.

No. 82. Otitis media purulenta chronica after pneumonia. Abscesses above and behind the ear-gravitation: abscess in meatus, neck, and nape of neck. Secondary superficial caries at the occiput. Perforation of antrum by chisel. Cure in four months.

No. 83. Otitis media purulenta chronica with caries necrotica of the mastoid. Operation. Cure in fifteen months.

No. 84. Chronic periostitis with sclerosis of the mastoid and numerous fistulous openings in the back and side of the neck. Perforation of the mastoid antrum with the chisel. Cure in two and one half months.

No. 85. Otitis media purulenta chronica for four months. Caries necrotica of the mastoid. Perforation with the chisel and sharp spoon. Cure in four weeks.

No. 86. Otitis media purulenta chronica duplex. Secondary periosteal abscess above the right mastoid and fistulous perforation of the corticalis. Dilatation with the chisel, scraping, and drainage. Death, four weeks after, from meningitis purulenta.

THE TREATMENT OF CERTAIN INTRACTABLE FORMS OF PURULENT DISCHARGE FROM THE EARS. THOMAS BARR, M. D. *Glasgow Medical Journal*. May, 1882.

The form of disease referred to in this paper is that in which the purulent pro-

cess has extended, and ultimately become limited, to the upper portion of the tympanum and antrum mastoideum. Purulent matter and inflammatory products are apt to be retained here, owing to the floor of the antrum being at a lower level than its outlet. The exit of secretions is further impeded by the swollen and hypertrophied condition of the mucous membrane, usually existing under such conditions, and by the osseous partition formed by the malleus and incus. In these cases the hearing is apt to be impaired from injury to the chain of ossicles: the discharge is usually fetid, owing to the tendency to accumulation of pus and consequent decomposition. There is also more danger in these cases, that the disease may extend to the dura mater, or blood poisoning be produced through absorption. Facial paralysis may occur. Great difficulty is consequently experienced in cleansing these parts, and applying the proper medicated solutions, as in ordinary syringing these regions are beyond the influence of the injected fluid. Polypi and granulations are frequently met with in such cases, and these must first be carefully removed. Then the external auditory canal is to be syringed with a mild solution of carbolic acid, and the parts, as far as can be seen, dried with absorbent cotton, applied through a speculum. When all the moisture that is accessible has been removed, Siegle's pneumatic speculum should be fitted airtight to the external auditory canal, and by employing suction, pus will generally be seen exuding from the parts above and behind. After this has been done, the upper portion of the tympanum and antrum mastoideum should be carefully washed with a solution of carbolic or boracic acids, by means of a middle-ear syringe. The instrument used is a vulcanite syringe, capable of holding about two drachms. After washing away the purulent matter, the parts should then be dried with absorbent cotton, and Siegle's speculum should be used as before. A solution of nitrate of silver (thirty grains to the ounce) is then to be injected by means of the same syringe.

CASE OF MASTOID ABSCESS WHICH RUPTURED INTO THE LATERAL SINUS. DEATH FROM PYÆMIA. D. W. PRENTISS, A. M., M. D. *American Journal of Medical Sciences*. May, 1882.

Charles H., aged thirty-one, had always been a strong and able-bodied man, but inherited a tendency to consumption. He had been subject at times to a chronic purulent discharge from one ear. In the spring of 1881, he had a severe attack of pharyngitis, with pain in the right side of the head. He had received treatment at various times for his ear disease, and lately had been in the hands of an irregular specialist.

During the early part of November he had suffered from earache, and headache on the right side, but he remained at work till the 10th. November 11th he was seized with a severe chill. It was evident that he was suffering from blood poisoning, as the chills became irregular, and were followed by high fever. There was marked pain in the right temporal region, and over the eye, but the

mastoid portion did not seem to be affected — there was no pain nor swelling there. The discharge from the ear consisted of thin purulent matter. It was then supposed that there had been an abscess of the mastoid cells, which had ruptured internally in the cranium. All symptoms, however, about the mastoid disappeared in about ten days, and in their place the liver and lungs became affected. The cough was troublesome, with considerable expectoration of muco-pus and blood. The liver appeared to be enlarged. Jaundice set in, and the urine was loaded with bile. Abscess of the liver was then suspected.

Autopsy. The spleen was greatly enlarged; kidneys large and anæmic; lungs congested and œdematous, and some pleurisy existed. The liver was slightly enlarged, and there were pyæmic infarctions in the various organs. The brain membranes were normal, as well as the cerebrum and cerebellum, except that a small abscess, one centimetre in diameter, was found in the anterior lobe of the left hemisphere of the cerebrum, at the border of the white substance. There was marked discoloration of the dura mater, covering the petrous portion of the right temporal bone, and beneath the membrane the bone was carious, and an abscess communicated by a free opening with the lateral sinus, which was filled with pus and clotted blood.

TWO CASES UNDER CARE OF MR. FIELD, ST. MARY'S HOSPITAL.

CASE I. *Cerebral Abscess.* S. T., aged forty-two, strong-bodied and healthy in appearance, appeared at the Hospital in March, 1882, and stated that he had been treated there some years ago for a discharge from the same ear, of which he had been cured. At present he was suffering no pain, but the ear had lately commenced to discharge again, and the matter was very offensive. In about a week afterwards his wife came to the Hospital and said he had some pain behind the ear. A few days after the patient died very suddenly.

Post Mortem. The dura mater was moderately adherent to the calvarium, and there was some pinkish injection of its inner layer; the arachnoid was sticky. There was found in the meshes of the pia mater, beneath the arachnoid of the sulci of the hemispheres, some yellowish puro-lymph, most abundant over the left temporo-sphenoidal lobe. The left lateral lobe of the cerebellum was adherent to the dura mater of the temporal bone, except where separated by an abscess cavity about the size of a walnut. The walls of the cavity were thin and spotted with minute extravasations. It contained very offensive greenish pus, and extended inwards as far as the middle lobe, where the tissue around was soft and grayish. No other abscess could be found.

The temporal bone was considerably necrosed with yellowish and greenish discoloration of the walls of the tympanum; one of the veins in the roof of which contained a blackish soft clot, and passed into the midst of the portion of bone united with the cerebellum. The dura mater was opaque and grayish over the necrosed portion. The cavity of the tympanum contained fetid, cheesy matter, and the membrana tympani was absent.

CASE II. Exostosis in the Auditory Canal. J. F., a young girl, aged eighteen, had suddenly become deaf, four weeks before, but during the previous eighteen months the hearing in the left ear had gradually become defective. She could hear well with the right ear. There was no history of gout or syphilis. Occluding the external auditory meatus, and firmly attached by a broad base to its posterior wall, was found an outgrowth of soft bone, which was painless when touched by the probe. After placing the patient under the influence of chloroform, and unsuccessfully trying to remove the growth with stump-forceps or the *écraseur*, the exostosis was severed from its attachment by means of an elevator, such as is used by dentists. It weighed only eight grains, notwithstanding its large size. It resembled a tooth in shape.

COMPOUND FRACTURE OF THE TYMPANIC PLATE BY INDIRECT VIOLENCE.
(Under care of Professor George Buchanan, Western Infirmary, Glasgow.)

Patient aged fourteen; admitted in February. The injury occurred by his falling into the hold of a vessel, a distance of twenty-five feet, his chin in the descent coming in contact with a wooden beam, placed half way down the hold. When first seen he was slightly stunned by the accident, and the surgeon who saw him suspected fracture at the base of the skull, and sent him to the Infirmary. He was received about an hour after the accident. At that time he was quite conscious. A wound two inches long extended across the base of the chin, and in front of each ear was a puffy swelling, painful to the touch. Bright red blood flowed from the right ear. When pressure was made on the swelling over the condyle, more blood would well up from the meatus. By passing in a probe for a distance of about three fourths of an inch, a bit of bare bone was revealed, which projected a little way into the middle ear at its anterior and lower border; a shred of the lining membrane, torn by the broken fragment, could be seen floating on the issuing blood. No hæmorrhage existed on the left side. No crepitus could be detected on the fractured side. Any attempt to close the jaws, which were three fourths of an inch apart, caused great pain. The lower jaw was placed much behind the upper, the recession being most marked on the right side. The blood oozed all day and part of next — hearing dull on right side. An examination of membrane could not be made, owing to the swelling of the parts.

FATAL OTITIS. Paper read before the Philadelphia County Medical Society by DR. G. C. HARLAN. *Philadelphia Medical Times*, August 27, 1881. —

Sarah G., aged four, of delicate constitution, had measles two years ago, and the discharge from both ears has been almost constant ever since. She received a blow on the left ear four months ago, and since then the discharge has been more copious from that ear, and the pain has been constant and frequently very severe. There has been no discharge for some weeks from the right ear. As the child was very nervous and restless, a thorough examination was not

made of the ear till five days following, November 11th. At that time it was noticed that there was facial paralysis, the face being drawn to the right side. Ether given, and several polypi filling the canal were removed with forceps. Posterior and upper wall of meatus eroded, membrane destroyed, and ossicula exposed. November 13th. — Child has slept much better since the operation, and her general appearance has improved; the facial paralysis more marked. Four days later seized with intense headache. Temperature, 102° F.; no pain in the ear. November 28th. — During the intervening time her condition has been about the same; intense headache, high fever; very quiet when kept in mother's lap, but at other times restless; has been conscious all the time till to-day, when she became comatose, and died in an hour afterward.

Post Mortem. — Cerebral membranes congested. The cerebrum was removed, and the tentorium beneath found bulging on the left side, and beneath it was found an abscess of the cerebellum containing about half an ounce of pus and clotted blood, the pia mater covering it partly destroyed, and the rest covered with lymph. The situation of the abscess was directly over the entrance of the internal auditory meatus. The edges of the dura mater at the entrance of the meatus were bared and covered with greenish pus. The rest of the brain and membranes healthy. There was almost entire destruction of the anterior wall of the external meatus; posterior portion bare and eroded; membrana tympani destroyed, while the inner wall and floor of the tympanum were bare; thickening of mucous membrane about the entrance of the Eustachian tube; partial erosion of the malleus and incus, while stapes had disappeared; fenestræ rotunda and ovalis uncovered; perforation in anterior edge of jugular fossa and floor of tympanum very thin. The facial and auditory nerves were diseased, and, when removed, walls of meatus were found bare throughout.

OTITIS MEDIA PURULENTA CHRONICA AND PYÆMIA. ROBERT SINCLAIR, M. D. *Edinburgh Medical Journal*, June, 1881.

Dr. Sinclair reports three cases of chronic suppuration of the middle ear terminating fatally.

CASE I. — Patient, male, aged twenty-two, had had a purulent discharge for many years from the right ear. About ten days before being admitted to the hospital he took cold. On admittance he was unconscious, singing and talking incoherently; limbs rigid; both eyes flushed; right pupil half the size of the left; breath sweet; pulse, 132; respiration, 54; distinct redness and swelling over right mastoid and its immediate vicinity. An incision was made into the mastoid, but no relief followed, and the bone was not spongy. Patient died six hours after admission.

Autopsy showed an abscess about the size of a hen's egg, having a direct communication with the middle ear; in the right posterior fossa, between the bone and dura mater; dura mater over the bone black and sloughing.

CASE II. — G. M., aged thirty-two. Purulent discharge from the right ear for three years. A week ago suddenly he felt a severe pain in the right side of his head. Has had distinct rigors. When he came to the hospital he complained of headache, thirst, anorexia. Pulse, 112; temperature, 102.2° F. Urine, albuminous; large perforation in membrana tympani after inspissated cerumen had been removed. Patient soon developed all the symptoms of pyæmia, and died on the fifth day after admission.

CASE III. — Patient a domestic, aged eighteen. She had had a discharge of pus from the left middle ear for ten years. On admission she complained of pain in the head. Pulse, 96; temperature, 103.6° F. The next day she showed evidences of pneumonia in left anterior and lateral region. Died on the fourth day with pyæmia.

As regards treatment, Dr. Sinclair recommends "the antiseptic," as he calls it.

I. The starting-point of the trouble is usually in the naso-pharyngeal space. Chronic catarrh is the most frequent affection. He uses gargles of potash and common salt, and if the nasal passages be affected, warm alkaline solutions should be injected by the post-nasal syringe. Inhalations of steam, medicated with carbolic acid, creosote, etc., should be used daily, and forced into the Eustachian tube by Valsalva's method.

II. The patient should hold his head over a basin, and a stream of a warm alkaline solution is forced along the external meatus, through the middle ear, Eustachian tube, and nasal passage; then inflation with Politzer's bag is employed; parts within are completely dried by absorbent cotton. After thorough cleansing has been accomplished iodoform in powder should be applied to the middle ear.

DIFFUSE INFLAMMATION OF THE EXTERNAL AUDITORY CANAL. E. CRESSWELL BABER, M. B., London: *British Medical Journal*, July 9, 1881.

Mr. Baber, in his paper on diffuse inflammation of the external auditory canal, in speaking of his plan of treatment, recommends leeching in *acute cases*. If leeches fail to relieve the pain, and there appears any risk of the bone becoming implicated, he advises incision. For anodyne drops, he prefers a strong solution of morphia, four grains of the acetate to two drachms of water, of which five to ten drops, lukewarm, are to be instilled into the ear every hour or so. The canal should be thoroughly cleansed with a gentle stream of water, and dried with absorbent cotton.

In *chronic cases*, cleansing is highly important, and is best done with cotton-wool, as too much syringing increases the swelling and irritation of the meatus. In addition, the instillation, three times daily, of a few drops of a weak solution of glycerine of borax (3ss. to water 3vjiss.) is very useful. To relieve any pain, he uses morphia in form of an ointment and placed on some cotton-wool, and in-

serted in the meatus. The plug, if carefully inserted, causes a dilatation of the canal.

LODGMET OF INSECTS IN THE EAR : *Australian Medical Journal*, Jan. 15, 1881.

Dr. J. A. Hardy reports a case which came to him with the following history : A young lady, aged twenty-three, of delicate constitution, cut her finger in March, whilst mincing up a kangaroo, and in consequence her hand swelled up and was very painful. Two months after, when the hand was healed, she complained of earache, and an abscess formed in the right ear. In three weeks the left ear became affected in the same way ; great discharges of matter and watery fluid have taken place, and at this time (September), after a copious discharge of watery blood from the right ear, about forty insects came from it. From this time till the latter part of September, when she came under Dr. Hardy's care, similar insects were discharged.

On examination : right ear swollen, and nearly full of purulent matter ; tenderness on pressure over the mastoid cells and extending down behind the angle of the jaws ; nine insects were brought out of the ear — she was quite deaf on that side. The inside of the ear could not be seen, owing to the copious discharge and tenderness. Warm carbolic oil (1-20) was used, and a warm alkaline lotion. A few days after this an opening occurred through the Eustachian tube into the throat, and a live insect came through into the mouth. Up to the present time, October 10th, one hundred and seven insects have come away, and the right ear is still filled with thick matter, and is very painful.

ABSCCESS OF LEFT MIDDLE CRUS CEREBELLI FOLLOWING OTITIS : *Australian Medical Journal*, April 15, 1881.

A. T., male, aged thirty-nine, was admitted to the hospital under care of Dr. Robertson. He was perfectly deaf, and although he could walk about and move his legs, he could give no account of his previous history. There was some purulent discharge from the left ear, and the face was drawn to the right side, and the tongue, when protruded, seemed to deviate to the same side. Conjunctiva inflamed, and he could not close the left eyelid ; a sensation of tightness across the back was complained of, and he was very restless ; bowels and urine natural. In ten days after admission he died. At the autopsy, the membrana tympani was found perforated, and carious erosion existed in the walls of the tympanum. The dura mater was easily peeled off from the upper and posterior parts of the petrous bone. An abscess, an inch and one fourth in diameter, was found in the left middle crus cerebelli, extending partly into the cerebellum itself, and inward into the pons, abutting on the fourth ventricle and pressing on the seventh nerve. The abscess protruded toward the internal auditory meatus. There was no pus or other inflammatory product between the bone and the dura mater ; no

vegetations on heart's valves; lungs congested and friable posteriorly. Abdominal organs fairly healthy.

ACETIC ACID IN NASAL STENOSIS : *Archives of Laryngology*, April 1, 1881.

In regard to the treatment of nasal stenosis due to hypertrophy especially limited to the anterior termination of the lower turbinated bone, Dr. F. H. Bosworth has found cauterization of the hypertrophic tissue with glacial acetic acid of great benefit. He has used it in a number of cases, and has rarely been disappointed in the results. He uses a probe, with two inches of its extremity flattened and bent at an angle of about 35° . He wraps a pledget of cotton around the probe, and saturating it with acetic acid, sweeps it rapidly through the nasal cavity. At the same time he holds an atomizer in the other hand, in order to spray the parts with Dobel's solution as soon as the probe has been withdrawn. This relieves any pain caused by the acid. The application of the acid causes more or less swelling and irritation, which continues about twenty-four hours; but soon an exfoliation of membrane occurs, and continues for several days, or a week. A single application of acetic acid generally affords marked relief, but usually a second or third application is required.

Bibliographical Index.

BOOKS.

BARATOUX, J.

Pathogenie des Affections de l'Oreille, éclairée par l'Étude Experimentale.

BYERSON.

On Earache, Running from the Ears, and Abscess of the Brain from Diseases of the Ear. Toronto, 1881.

CONGRÈS PÉRIODIQUE INTERNATIONAL D'OTOLOGIE.

Compte Rendu. Comprenant les Procès-verbaux des Séances, les Memoires lus ou déposés, etc. 2 Sess., Milan, 1880. Trieste, 1882. 8vo, pp. 218.

FORNARI, P.

Compte Rendu du Congrès International pour l'Amélioration du Sort des Sourds-muets, tenu à Milan du 6 au 11 Sept., 1880. Rome, 1881. 8vo, pp. 326.

GUÉRIN, C.

Surdité, Bruits, leur Nature, leurs Causes, leurs Symptomes. Guide de mon Traitement. 16th edit. Paris, 1881. 12mo.

HAERTER, M.

Das menschliche Ohr und seine Krankheiten. Constance, 1881. 8vo, pp. 19.

KIRCHNER, W.

Apparat zur Aspiration und Ausspülung von Exsudatmassen aus der Paukenhöhle. Würzburg, 1882. .

MITTENDORF, W. F.

A Manual on Diseases of the Eye and Ear, for the Use of Students and Practitioners. 2d edition. New York, 1882.

MOLDENHAUER, W.

Zur Physiologie des Gehörorganes Neugeborener: Beiträge zur Geburtshilfe, Gynäkologie und Pädiatrik, gewidmet dem Herrn Geh. Medicinalrath Dr. Crédé. Leipzig, 1881. (Review, Monatschr. f. Ohrenh. 2 Bl. 12. 1881.)

MOOS.

Epidemic Cerebro-spinal Meningitis and the Subsequent Combined Disturbances of Hearing and Equilibrium. Heidelberg. 8vo, pp. 68. (Review by O. Wolf; trans. by J. A. Spalding. Arch. Otol. N. Y., Dec., 1881.)

Ueber Meningitis Cerebro-spinalis Epidemica. 8vo, pp. 68. Heidelberg, 1881.

MOOS, S., POLLNOW, H., and SCHWABACH, D.

Die Gehörstörungen des Locomotive-personals und deren Einfluss auf die Betriebssicherheit der Eisenbahnen. 2 Abdr. Wiesbaden, 1882. 8vo.

NAEF, A.

Das Loos der Blinden und Taubstummen. Zürich, 1880.

RETZIUS.

Biologische Untersuchungen, mit 14 Tafeln. 8vo.

TREIBEL, E.

The Second International Congress of Teachers of the Deaf-mute, in Milan, 1881.

WINSLOW, W. H.

The Human Ear and its Diseases. N. Y. and Phil., 1882, pp. 526. 138 illustrations.

JOURNALS.

AGNEW, C. R., and WEBSTER, D.

Clinical Contributions to Otology; Binaural Deafness, probably due to Simultaneous Exudations into both Labyrinths. Wound of the Membrana Tympani by an Oak Stub. Double Rupture of the Membrana Tympani from a Blow. Supposed Foreign Body in the Tympanum. Arch. Otol. N. Y., Dec., 1881.

ALAN, R. M.

A Case of Acute Aural Vertigo. Lancet, Feb. 4, 1882.

ALLAN, W.

On two Large Auricular Growths following the Operation of Puncture. Dublin J. M. Sc., March, 1882; M. & S. Rep., Phila., April 22, 1882.

AMICH, W. R.

Reflex Neuroses from Irritation of the External Auditory Canal. Cincin. M. News, April, 1882.

ANONYMOUS.

Ueber den therapeutischen Werth medicamentöser Einspritzungen durch die Eustachische Ohrtrumpete, ohne Zuhilfenahme eines Katheters. Allg. Wiener Med. Ztg., Nos. 1 and 2, 1882.

Inflammations of the Nasal Passages; Eustachian Tube and Middle Ear. Notes of Hospital Practice, Part I. Philadelphia Hospitals, 1882.

Mr. Thomas Arnold's Method of Teaching Articulation. Am. Ann. of the Deaf and Dumb. Washington, April, 1882.

ARIZA.

Otologie; Catarrhe Chronique de l'Oreille. El Siglo Med., March 19 and 26, 1882.

ATWOOD, F.

Cases of Discharge from the Ear, of Long Standing, the Result of Scarlet Fever. *Trans. Minn. M. Soc., St. Paul, 1881.*

Ear Diseases after Measles. *Trans. Minn. M. Soc., St. Paul, 1881.*

AYRES, S. C.

Exostoses of the External Auditory Canal. *Arch. Otol., N. Y., 1881, X. 327.*

BABER, E. C.

Chronic Non-purulent Disease of the Middle Ear; Great Benefit from the Audiphone. *Specialist, Dec. 1, 1881.*

BADAL.

Sehstörungen bei Taubstummen. *Ann. des Mal de l'Oreille. Nov. 4, 1881.*

BALL.

Considerations sur les Hallucinations Unilatérales de l'Ouïe Consécutives à une Inflammation Chronique de l'Oreille Moyenne. *Acad. de Med., Paris, Séance of Feb. 21, 1882.*

BARATOUX, J.

Pathologie et Therapeutique Générale de l'Oreille, Diagnostic. *Rev. Mens. de Laryngol., d'Otol., etc., March, May, 1882.*

BARR, T.

Statistical Report of 1,088 Cases of Ear Disease treated in the Glasgow Western Infirmary from 6th November, 1877, till 28th May, 1881, with Observations. *Glasgow M. J., 1882, XVII. 93.*

Furuncular or Circumscribed Inflammation of the External Auditory Canal, Otitis Externa Circumscripta; Boils in the Ear. *Glasgow M. J., March, 1882.*

Mastoid Periostitis. *Glasgow M. J., XV. 5.*

Foreign Bodies in the Ear. *Glasgow M. J., Dec., 1881.*

BENNI.

Quatre Cas d'Hémorrhagie Auriculaire Ambilatérale. *Trans. Cong. Périod. Internat. d'Otol. 2 Sess. Trieste, 1881, 158.*

BENSON, A.

Necrosis of Right Temporal Bone. *M. Press and Circ., Lon., March 22, 1882.*

BLAKE, C. J.

Tubular Snare for the Removal of Polypi. *Boston M. and S. J., April 20, 1882.*

Auswahl von Worten zur Prüfung der Hörschärfe in Bezug auf ihren logographischen Werth. (Uebersetzt von H. Steinbrügge.) *Ztsch. f. Ohrenh. Wiesbaden, 1881-2, XI. 29.*

BONNAFONT.

Réflexions sur les Phénomènes Nerveux, tels que Vertiges, Titulations, Manque d'Équilibre, etc. Généralement Attribués aux Canaux semi-circulaires, pouvant également être produits ou provoqués par la simple

Pression de la Membrane du Tympan et de la Fenêtre Ovale. *Ann. des Mal de l'Oreille, du Larynx, etc.*, March, 1882.

BOUCHÉRON.

Des Troubles de l'Equilibration chez les Jeunes Enfants, Sourds-muet par Otopiésis; de leur Disparition lors du Retour de l'Ouïe. *Compt. Rend., Acad. d. Sc., Paris*, 1882, XCIV., 538.

Nouveau Cas de Guérison de la Surdi-mutité Infantile par Otopiésis. *Trans. Internat. M. Cong.*, 7 Sess., Lond., 1881, III., 428.

De la Surdi-mutité par Hypertonie Auriculaire et de sa Curabilité. *Trans. Cong. Périod. Internat. d'Otol.*, 2 Sess., Trieste, 1881, 109.

BROWN, A. G.

The Acoustic Potentials of the Human Auricle. *Lancet, Lond.*, 1881, II., 1082.

The Sense of Touch as a Standard of Comparison for Hearing Power. *Trans. Internat. M. Cong.*, 7 Sess., Lond., 1881, III., 430.

BROWN, L.

Résultat d'Experiences faites avec l'Audiphone sur Cent Malades souffrant de Surdité. *Trans. Cong. Périod. Internat. d'Otol.*, 2 Sess., Trieste, 1881, 133.

BURNETT, C. H.

Aural Vertigo. *Phila. M. Times*, June 3, 1882.

BURNETT, S. M.

Otomyces Purpureus (Wreden) in the Human Ear. *Arch. Otol., N. Y.*, 1881, X., 319.

Abstract of American Otological Literature, during the second and third Quarters of the Year 1881. *Arch. Otol., N. Y.*, Dec., 1881.

CALMETTES.

Désinfection de l'Iodoforme. *Prog. Méd.*, Paris, March 4, 1882.

CASSELLS, P.

Two Cases of Chronic Muco-tympanitis from Hereditary Syphilis. *Glasgow M. J.*, 1882, XVII., 58.

CERUTTI, G.

Di un Corpo Estraneo Rimasto Impunemente nell' Orecchio pel Corso di Dodici Anni. *Osservatore, Torino*, 1881, XVII., 769.

CHAMBERLAIN, W. M.

The "Powderblower" for Iodoform. *Med. Rec.*, N. Y., April 15, 1882.

CORE, A. S.

Zwei Fälle von Anwendung der Baumwolle-Kügelchen bei Zerstörung des Trommelfelles. (Uebersetzt von H. Steinbrügge.) *Ztschr. f. Ohrenh.*, Wiesb., 1881-2, XI., 38.

COVERNTON, C. W.

On the Use of the Ophthalmoscope in Diseases of the Ear. *Canada Lancet*, Toronto, April, 1882.

CZARDA, G.

Ueber das Audiphon und seine Verwendbarkeit bei Schwerhörigen. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 180.

Zur Behandlung der chronischen Otorrhœ mit Jodoform. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 185.

D., D. B.

The Expulsion of Insects from the External Auditory Canal. Med. Rec., N. Y., 1881, XX., 752.

DELL'ACQUA.

Sunto Fisiologico della Funzione Uditiva. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 190.

DELSTANCHE.

Cancer Épithélial Primitif du Canal Externe de l'Oreille; Observation Recueillée par les Docteurs Delstanche, Fils, et Stocquart. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 144.

Note sur l'Adénotome à Coulisse. Trans. Cong. Périod. Internat. d'Otol., Trieste, 1881, 194.

DE ROSSI, E.

Caso di Otitè Media Purulenta Cronica con Carie Consecutiva dell' Ossa Temporale, dell' Occipite, e delle Prime due Vertebre Cervicali. Bull. d. r. Accad. Med. di Roma, 1881, VII., 206.

Della Terapia in Genere, e Specialmente della Medicina Operativa nelle Malattie dell' Orecchio. Gior. Internaz. d. Sc. Med., Napoli, 1881, N. S., III., 965; Ann. des Mal de l'Oreille, du Lar., etc., March, 1882.

DESPRES.

Otite Interne, Suppuration des Cellules Mastoïdiennes, Trepannation. Gaz. des Hôp., Paris, April 20, 1882.

DUNCANSON, K.

Periscope of Otology. Edinburgh, April and May, 1882.

DWIGHT, H. E.

Insanity and Suicide due to Ear-Disease. Phila. M. Times, May 6, 1882.

EDWARD.

De la Greffe Cutanée dans les Suppurations Chroniques de l'Oreille Moyenne. Zeitsch. f. Ohrenh., Band X., II.

EITELBERG, A.

Zur Behandlung der chronischen Otorrhœa. Wiener Med. Presse, Nos. 13, 14, 15 und folg., 1882.

ELLIS.

Remarks on Diseases of the Middle Ear and Mastoid Cells. Cin. Lancet and Clinic, May 6, 1882.

ELY, E.

Iodoform in Suppuration of the Middle Ear. Med. Rec., N. Y., March 25, 1882.

ELY, E. T.

Eine Operation zur Verbesserung der Stellung absteigender Ohrmuscheln. (Uebersetzt von H. Steinbrügge.) *Ztsch. f. Ohrenh.*, Wiesb., 1881-2, XI., 35.

Pyämie im Gefolge eines Abscesses im Wartenfortsatz; Genesung ohne interne Medication. (Uebersetzt von H. Steinbrügge.) *Ztsch. f. Ohrenh.*, Wiesb., 1881-2, XI., 31.

FAY, E. A.

A Will by Pantomime. *Am. Ann. of the Deaf and Dumb.* Washington, April, 1882.

The Pronunciation of the Deaf. *Am. Ann. of the Deaf and Dumb.* Washington, April, 1882.

FIELD, G. P.

Cases of Removal of Osseous Tumors from the Auditory Canal. *Lancet*, Lond., Jan. 21, April 1, 1882; *Brit. M. J.*, Jan. 28, 1882; *Med. Press*, Jan. 25, 1882; *M. Times and Gaz.*, Lond., Jan. 28, 1882.

Cases in Aural Practice. *Brit. Med. Journ.*, May 6, 1882.

FITZGERALD, C. E.

Objective Noises in the Ear. *Trans. Internat. M. Cong.*, 7 Sess., Lond., 1881, III., 383.

FLESCHE, M.

Kleinere Beiträge zur normalen und pathologischen Anatomie des Gehörorgans. *Arch. f. Ohrenh.*, XVIII., 1 and 2.

FOURNIÉ, E.

Du Rôle Physiologique de la Trompe d'Eustache. *Trans. Cong. Périod. Internat. d'Otol.*, 2 Sess., Trieste, 1881, 119.

De l'Instruction Physiologique du Sourd-muet. *Trans. Cong. Périod. Internat. d'Otol.*, 2 Sess., Trieste, 1881, 96.

Physiologie der Stimm- und Sprachklänge. *Rev. M. Franc. et Étrang.*, Oct., 1881; *Review Monatsch. f. Ohrenh.*, Berl., XVI., 2, 3 Bl., Feb., 1882.

FOWLER, W. P.

A Condensed Report of sixty-three Cases of Insipissated Cerumen. *Trans. Homœop. M. Soc.*, N. Y., 1880-1; Havana, 1882, XVI., 403.

Two Cases of Otitis Media Suppurativa, resulting from the Use of the Nasal Douche. *Trans. Homœop. M. Soc.*, N. Y., 1880-1, Havana, 1882, XVI., 401.

FRANK, S. L.

A Case of Chronic Purulent Otorrhœa with Perforation of both Membranæ Tympani, followed by Disease of the Labyrinth, and Facial Paralysis of the Right Side. *Maryland M. J.*, Balt., 1881-2, VIII., 437.

FRÄNKEL, B.

Ein Fall von Worttaubheit. *Berl. Klin. Wochenschr.*, Aug., 1881.

GARRETSON.

The Dental Engine modified for Surgical Uses. *Ann. Anat. and Surg.*, March, 1882.

GARRETT, E.

Visible Speech; A Plan for Supplying the Demand for Articulation Teachers; and Remarks on Methods of giving Speech to the Deaf. *Am. Ann. of the Deaf and Dumb*, Washington, April, 1882.

GELLÉ.

Otitis Suppurées à la Suite du Tamponnement Postérieur des Fosses Nasales. *Trib. Med.*, Paris, March 26, 1882.

Des Illusions et des Hallucinations de l'Ouïe en Rapport avec une Lésion Fonctionnelle ou Organique de l'Oreille. *Trib. Med.*, Paris, March 12, 1882.

De l'Accommodation de l'Oreille; Retard de la Sensation; Étude Physiopathologique. *Trans. Internat. Cong.*, 7 Sess., Lond., III., 393.

Les Lésions Nerveuses dans la Surdit . *Trans. Internat. M. Cong.*, 7 Sess., Lond., III., 370.

GIAMPIETRO, E.

La Perforazione del Timpano a Scopo Terapeutico. *Salute: Italia Med.*, Genoa, 1881, 2 S., XV., 369.

Lo Speculum Perforante del Timpano. *Jour. Internat. des Sci. Med.*, 1880, 4.

GOTTSTEIN.

Elimination Necrotique de presque tout d'Os Temporal Suivie de Gu rison. *Trans. Cong. P riod. Internat. d'Otol.*, 2 Sess., Trieste, 1881, 83.

Sur un Cas de Myringite Aigue avec Abondante Desquamation. *Trans. Cong. P riod. Internat. d'Otol.*, 2 Sess., Trieste, 1881, 143.

GOTTSTEIN, J., and KAYSER, R.

Ueber die Geh rsverminderung bei Schlossern und Schmieden. *Bresl. Aerztl. Ztschr.*, 1881, 18.

GRAF, F.

Zur Casuistik der desquamativen Entz ndung des Geh rganges. *Monatsch. f. Ohrenh.*, Berl., Dec., 1881.

GRAZZI, V.

Dell' Iperτροφια della Tonsille come Causa di Malattie dell' Organo Uditivo. *Arch. Ital. di Laringol.*, Napoli, 1881-2, I. 5, 7.

Del Bagno a Vapore Naturale della Grotta di Monsummano nelle Malattie dell' Orecchio. *Giornale Int. delle Sc. Mediche*, Anno III.

Sur la Perforation du Tympan et un Nouvel Instrument pour la pratiquer. *Trans. Cong. P riod. Internat. d'Otol.*, 2 Sess., Trieste, 1881, 84.

GREEN, J. ORNE.

Recent Progress in Otology. *Boston M. and S. J.*, June 8, 1882.

GRUBER, J.

Beiderseitiger, acuter Mittelohrkatarrh; serosschleimiges Exsudat in beiden Paukenhöhlen; bilaterale Paracentese des Trommelfelles; Heilung. Allg. Wien. Med. Ztg., 1882, XXVII., 84.

Ueber den therapeutischen Werth medicamentöser Einspritzungen durch die eustachische Ohrtrumpete ohne Zuhilfenahme eines Ohrkatheters. Allg. Wien. Med. Ztg., 1882, XXVIII., 1.

HACKLEY, C. E.

Einathmung von Chloroform als Ursache von Ohrerkrankung. (Uebersetzt von H. Steinbrügge.) Ztschr. f. Ohrenh., Wiesb., 1881-2, XI., 3.

HAMMOND, G. M.

The Hypothetical Auditory Tract in the Light of Recent Anatomical Investigations. Jour. Nerv. and Ment. Dis., N. Y., July, 1881.

HANKS, H. T.

Use of Calcium Sulphide as an Anti-Suppurative. Boston M. and S. J., May 11, 1882.

HARLAN, G. C.

Three Cases of Mastoid Disease treated by Trephining. M. News, Phila., May 27, 1882.

HARTMANN, A.

Report on the Progress of Otology in the Second Half of the Year 1881; Pathology and Treatment of the Organ of Hearing. Arch. Otol., N. Y., April, 1882.

De la Surdi-mutité. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 94.

Recherches Manométriques sur la Résistance du Voile du Palais et de leur Importance Diagnostique et Thérapeutique. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 114.

HAVSTAD, L. A.

The Deaf-mute Institutions of Norway. Am. Ann. of the Deaf and Dumb, Washington, April, 1882.

HEDINGER.

Die Ohrenkrankheiten des Locomotive personals; zur Frage der Berufskrankheiten. Deutsche Med. Wehnschr., Berl., 1882, VIII., 63.

HENSEN, V.

Nachtrag zur meinen "Bemerkungengegen die Capsula Terminalis (Lang)." Arch. f. Anat. u. Entwcklingsch., Leip., 1881, 405.

HERZAY.

Ohrgeräusche durch Aneurismatische Erweiterung der Arteria Auricularis Posterior. Monatsch. f. Ohrenh., No. 8, 1881.

HÖGYES, A.

Ueber die wahren Ursachen der schwindelerscheinungen bei der Druck-

steigerung in der Paukenhöhle. (Vorläufige Bemerkungen zur Physiologie und Pathologie der Bogengänge.) Arch. f. d. Ges. Physiol. und Pathol. der Bogengänge. Arch. f. d. Ges. Physiol. Bonn, 1881, XXVI., 558.

HÖGYES, E.

A szédülés igazi okásól fokozodott dobürbeli myomasnal (aural vertigo).

Orvosi hetil., Budapest, 1882, XXVI., 1.

HOLBECH, A. O.

Disease of Ear and Abscess of Brain. Brit. M. J., March 4, 1882.

HUGENTOBLE, J.

The Origin of Deaf-mute Instruction at Zürich, Switzerland. Am. Ann. of the Deaf and Dumb, Washington, April, 1882.

KAMEYA, IWA.

Dermal Horn of Auricle. Tokei Iji., Shinshi, Sept. 3, 1881.

KELLER.

Ein Beitrag zur Casuistik der acquirirten Taubstummheit. Berliner Klin. Wochenschr., No. 40, 1881.

KIBBE, A. B.

Treatment of Chronic Catarrhal Inflammation of the Middle Ear by Fluid Injections. Rocky Mt. M. Times, March, 1882.

Progress in Ophthalmology and Otology. Rocky Mt. M. Times, March, 1882.

KIPP, C. J.

Ein Fall von Epithelioma des Mittelohres. (Uebersetzt von H. Steinbrügge.) Ztsch. f. Ohrenh., Wiesb., 1881-2, XI., 6, 8.

KIRCHNER, W.

Beitrag zu den Circulations- und Secretionsverhältnissen in der Paukenhöhle. Monatsch. f. Ohrenh., April, 1882.

Beitrag zur Topographie der äusseren Ohrtheile mit Berücksichtigung der hier Einwirkenden Verletzungen. Würzburg Phys. Med. Verhandlungen, XVI., 1881.

KNAPP, H.

Beiderseitige Rudimentäre Ohrmuschel mit Fehlen der äusseren Gehörgänge. Ztschr. f. Ohrenh., Wiesb., 1881-2, XI., 55.

Congenital Fibrous Closure of the Auditory Meatus; Opening Frustrated by Hæmatophilia. Arch. Otol., N. Y., April, 1882.

A Case of Transient Poisoning from the Instillation of a Few Drops of Atropia into a Healthy Ear Canal. Arch. Otol., N. Y., April, 1882.

Trephining of Mastoid in a Case of Otitis Catarrhalis Chronica, with an Intact Membrana Tympani; Opening of the Lateral Sinus; Recovery by First Intention. Arch. Otol., N. Y., 1881, X., 365.

LADREIT DE LACHARRIERE.

De l'Otite Labyrinthique. Ann. des Mal de l'Oreille, du Larynx, etc., Nov., 1881.

LAMBERT, C. A.

Coccobacteria in Purulent Otorrhœa. Chicago M. J. and Exam., 1882, XLIV., 7. Southern M. Rec., Feb. 20, 1882.

LANGTON, J.

Two Cases of Acute Purulent Catarrh of the Middle Ear treated by the Injection of an Alkaline Fluid through the Tympanum. St. Barth. Hosp. Rep., London, 1881, XVII., 185.

LANNELONGUE.

Tumeurs Congenitales de la Face. Soc. de Chir., Séance du Mars 22, 1882.

LICHTENBERG, K.

Sollen wir bei der acuten Circumscriphten Entzündung des äussern Gehörganges Incisionen Machen? Pest. Med. Chir. Presse, Budapest, 1882, XVIII., 74, 89.

LLOYD, J.

Fractures of the External Auditory Process of the Temporal Bone from Indirect Violence. Brit. M. J., Feb. 11 and Mar. 11, 1882.

LOEWENBERG, B.

Recherches sur la Présence de Micrococcus, dans l'Oreille Malade; Considérations sur le Rôle des Microbes dans le Furoncle Auriculaire et la Furunculose Générale; Applications Thérapeutiques. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 17.

On the Occurrence and the Significance of Coccobacteria in Purulent Otorrhœa, with Remarks on the Treatment of Cases in which they are Present. (Trans. by J. A. Spalding.) Arch. Otol., N. Y., Dec., 1881.

On Difficult Cases of introducing the Eustachian Catheter and a Method facilitating the Operation in Three Cases. Trans. Internat. M. Cong., 7 Sess., Lond., III., 432.

Pourquoi certains Sourds Tiennent-ils la Bouche entr' ouverte? Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 89.

Galvano-cautère Nasal. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 159.

LOVE, J.

Fracture of Base of Skull; Recovery. Glasgow M. J., XVI., 3.

LOWDELL, E.

Removal of Foreign Bodies from the Ear. Med. Times and Gaz., Lond. Feb. 25, 1882.

LUCAE, A.

Zur physikalischen differentiellen Diagnostik zwischen Erkrankung des schall-leitenden Apparates und Nerventaubheit mit Demonstrationen. Trans. Internat. Med. Cong., 7 Sess., Lond., 1881, III., 372.

MCBRIDE, P.

Diseases which Involve the Organ of Hearing. Edin. M. J., Mar., 1882.

McKEOWN, WM.

New Method of Treatment of Relaxation of Membrana Tympani.

MACNAUGHTON, H.

Some Remarks on Aural Therapeutics. Dublin J. M. Sc., 1882, 3 S., LXIII., 14.

MALLERY, G.

Sign Language among North American Indians compared with that among Other Peoples and Deaf-Mutes. (From first annual report of the Bureau of Ethnology, 1879-80.) Washington, 1881, 4to.

MANBY, A. R.

Case of Acute Auditory Vertigo. Lancet, London, Feb. 4, 1882.

MARCHIAFAVE.

Sur les Polypes Auriculaires. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 127.

MASINI, O.

Asportazione di un Fibroma del Lobulo dell' Orecchio. Imparziale, Firenze, 1881, XXI., 705.

MÉNIÈRE.

Du Traitement de l'Otorrhée Purulente Chronique. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 58.

Quelques Considérations sur la Maladie de Ménière. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 67.

MICHAEL, J.

Die chronischen Kehlkopfaffectationen der Kinder in Gefolge von acuten Infectionskrankheiten. Deutsch. Arch. f. Klin. Med., Bd. 27.

Ein flüssiges künstliches Trommelfell und eine neue Behandlungsweise chronischer Otorrhœen. Berl. Klin. Wehnschr., 1882, XIX., 121.

MOORE, W. O.

Acute Otitis Media supervening on Otitis Media Purulenta Chronica, resulting in Necrosis of Temporal, Occipital, and Parietal Bones, with Closure of Lateral Sinus and Abscess of Cerebellum. Arch. Otol., N. Y., April, 1882.

Moos, S.

Double Hearing during the Exhibition of Iodide of Potassium. (Trans. by J. A. Spalding.) Arch. Otol., N. Y., April, 1882.

Ein Fall von doppelseitiger Labyrinthaffection mit taumelnden Gang und bleibender Vernichtung des Gehörs nach Mumps. Ztschr. f. Ohrenh. Wiesb., 1881-82, XI., 51.

Sur un Cas Rare de Blessure du Côté Gauche du Crâne par un Instrument Aigu; Irritation Passagère des Nerfs Moteurs Oculaires et Pneumogas-

- triques Gauches ; Paralysie Permanente des Nerfs Faciaux et Acoustiques Gauches; De l'Importance de l'Exploration par le Diapason dans le Diagnostic des Lésions du Crâne. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 48.
- Sur les Maladies de l'Oreille des Chauffeurs et Conducteurs de Locomotive et les Dangers auxquels elles exposent. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 23.
- Sur un Cas d'Atrophie Nerveuse du Premier Tour du Limaçon et de l'Importance Physiologique et Pathologique de cette Affection. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, V., 39.
- MOOS, S., and STEINBRÜGGE, H.
- On the Combined Occurrence of Rachitic Alterations and Disturbances of Development in the Ears of a Crétin. (Trans. by J. A. Spalding.) Arch. Otol., N. Y., April, 1882.
- A Case of Double Labyrinthine Affection, with Staggering Gait and Permanent Abolition of Hearing after Mumps. (Trans. by J. A. Spalding.) Arch. Otol., N. Y., April, 1882.
- Hyperostosen- und Exostosenbildung; Hammerkopf ankylose; knöcherner Verschluss des runden Fensters; colloide Entartung des Hörnerven in dem Felsenbein einer 80 jährigen halluciren den Geisteskranken. Ztschr. f. Ohrenh., Wiesb., 1881-2, XI., 48.
- Hyperostosis and Exostosis; Anchylosis of the Head of the Hammer; Bony Occlusion of the Round Window; and Colloid Degeneration of the Auditory Nerve in the Petrous Bone of an Aged Lunatic affected with Hallucinations. (Trans. by J. A. Spalding.) Arch. Otol., N. Y., April, 1882.
- Ueber das combinirte Vorkommen von Entwicklungsstörungen und rachitischen Veränderungen im Gehörorgan eines Cretinen. Ztschr. f. Ohrenh., Wiesb., 1881-2, XI., 40.
- MOOS, S., and WOLF, O.
- On Epidemic Cerebro-Spinal Meningitis and the Subsequent Combined Disturbances of Hearing and Equilibrium. Arch. Otol., X., 4.
- MUNSON, G. S.
- A Case of Chronic Suppurative Otitis with Exostosis of the Auditory Canal, Abscess of the Brain, Death, Autopsy. Arch. Otol., N. Y., April, 1882.
- NOQUET.
- Névralgie de l'Auriculo-temporal; des Branches Auriculaires et Mastoïdiennes du Plexus Cervical; de quelques Filets du Pneumogastrique, provoquée par un Bouchon de Cérumen développé dans le Conduit Auditif droit, autour d'un Graine d'Avoine entré à l'insu du Malade. Bull. Med. du Nord., Lille, 1881, XX., 483.

PECK, E. S.

Extraction of Two Pieces of Glass from the Auditory Canal ; Remarks on its Acoustic Disturbances. *Med. Rec., N. Y.*, 1882, XXI., 229.

PIERCE.

Case of Rodent Ulcer of the Auricle and External Auditory Meatus. *Brit. M. J.*, Jan. 7, 1882.

PINDER, T. H.

Suppuration of the Mastoid Cells ; Operation. *Brit. M. J.*, Lond., 1881, II., 896.

POLITZER, A.

Sur quelques Résultats de l'Examen Anatomo-pathologique du Labyrinthe. *Trans. Cong. Périod. Internat. d'Otol.*, 2 Sess., Trieste, 1881, 7.

Recherches Experimentales sur la Paracousie de Willis. *Trans. Cong. Périod. Internat. d'Otol.*, 2 Sess., Trieste, 1881, 81.

Krankengeschichte und Sectionsbefund eines, an Carcinoma Aur. Med. et Labyrinth. dext., verstorbenen 47 Jährigen Mannes. *Trans. Internat. M. Cong.*, 7 Sess., Lond., 1881, III., 406.

POLLAK, S.

Rational Therapeutics in Purulent Otorrhœa, or Perforating Suppuration of the Middle Ear. *St. Louis Cour. Med.*, May, 1882; *St. Louis M. & S. J.*, May, 1882.

Necrosis and Elimination of almost the Whole Bony Apparatus of Hearing in an almost Complete Form ; Recovery. *Arch. Otol.*, X., 4 ; *Ann. des Mal. de l'Oreille, du Lar.*, etc., March, 1882; *St. Louis Cour. Med.*, March, 1882.

POMEROY, O. D.

Chronic Suppurative Inflammation of the Middle Ear. Notes of Hospital Practice. Part II. *New York Hospitals*, 7, 1882.

Acute Circumscribed Inflammation of the External Auditory Meatus. *M. Rec.*, N. Y., Feb. 25, 1882.

POPE, F. A.

Purulent Otitis of the Middle Ear ; Caries of a Portion of the Temporal Bone ; Unilateral Facial Paralysis. *Dublin J. M.*, April, 1882.

PRENTISS, D. W.

Case of Mastoid Abscess which Ruptured into the Lateral Sinus ; Death from Pyæmia. *Am. J. M. Sci.*, Phila., April, 1882.

PURICELLI, C.

Ein Einfaches Verfahren, arzneiflüssigkeiten auf die Nasenschleimhaut zu appliciren oder ins Mittelohr zu treiben. *Berl. Klin. Wehnschr.*, 1882, XIX., 121.

QUINN, JAMES L.

Two Cases of Chronic Otorrhœa producing Caries of Petrous Portion of

Temporal Bone — one with Cerebral Abscess, the other with General Meningeal Inflammation and Meningeal Abscesses. *Beston M. & S. J.*, May 18, 1882.

RATH-HEDINGER.

Affections de l'Oreille chez les Employés de Chemin de Fer. *Deutsch. Med. Wochenschr.*, 5, 1882.

RAVOGLI.

De l'Influence de la Syphilis sur les Maladies de l'Oreille. *Trans. Cong. Périod. Internat. d'Otol.*, 2 Sess., Trieste, 1881, 129.

RÉGIS.

Note sur un Cas d'Hallucinations Unilatrales de l'Ouïe, consecutive à une Inflammation Chronique de l'Oreille Moyenne. *France Med.*, March 23, 1882.

ROBINSON, B.

The Laryngeal Affections of Pulmonary Phthisis. *Arch. Laryngol.*, II., 4.

ROK, J. O.

Nasal Stenosis ; its Influence on Olfaction, Audition, Vocalization, and Respiration, and its Treatment. *Trans. Med. Soc. N. Y.*, 1881.

ROOSA, D. B. ST. J.

Die Klinische Diagnose der Neuritis und Atrophie des Hörnerven. (Uebersetzt von H. Steinbrügge.) *Ztschr. f. Ohrenh., Weisb.*, 1881-2, XI., 9.

ROSEBRUGH, A. M.

Abscess of the Mastoid Cells from the Use of the Nasal Douche. *Canada Lancet*, 1882, VI., 206.

ROSSI.

Resorcin in Aural Surgery. *Arch. Otol.*

RUMBOLD.

The Eustachian Tube. *St. Louis M. and S. J.*, 1881.

RUSHMORE, J. D.

History of a Case of Hæmorrhage from the Ear, probably due to a Fracture of the Skull ; Recovery. *Arch. Otol., N. Y.*, Dec., 1881.

SAPOLINI, J.

Tableau pour une Nouvelle Enquête Statistique sur les Sourds-muets, sur les Sourds non Muets, sur les Muets non Sourds, et sur les Bégayeurs, propose au Cong. Internat. de Genève. *Trans. Cong. Périod. Internat. d'Otol.*, 2 Sess., Trieste, 1881, 201.

SCHÄFER.

Ein Fall von Herderkrankung des Schläfenlappens. *Centralbl. f. Nerven.* 1881, 3.

SCHWARTZ.

Sur quelques Traitements de l'Otorrhée. *Jour. de Therap., Par. ; Ann. et Bull. de la Soc. de Med. de Gand.*, March, 1882.

SEELY, W. W.

Treatment of Chronic Suppuration of the Middle Ear ; Clinical Remarks.
Cincin. Lancet and Clinic, 1882, N. S., VIII., 151.

SEXTON, S.

Frequency of Aural Complications. Med. Rec., N. Y., June 3, 1882.

Calcium Sulphide as an Anti-Suppurative. Med. Rec., N. Y., April 29, 1882.

On Acidum Boracicum and Calendula Officinalis, and their Uses in Aural Disease. Med. Rec., N. Y., Dec. 31, 1881.

Facial Paralysis in Connection with Aural Disease. Illus. Qrly. Med. and Surg., Jan., 1882.

SHELLY, C. E.

The Simplest Ear Irrigant. Lancet, London, April 8, 1882.

SMITH, A. H.

Calcium Sulphide as an Anti-suppurative. M. Gaz., N. Y., May 13, 1882.

SOCKEEL, A.

Étude sur l'Hématome de l'Oreille. Rec. de Mém. de Méd . . . Mil. Par., 1881, 3 s., XXXVII., 605.

SOUWERS, G. F.

Impacted Cerumen ; some of its Causes and Treatment. M. and S. Rep., Phila., April 22, 1882.

STEINBRÜGGE, H.

A Case of Diplacusis. (Trans. by J. A. Spalding.) Arch. Otol., N. Y., April, 1882.

Report on the Progress of Otology in the Second Half of the Year 1881; Normal and Pathological Anatomy of the Organ of Hearing. Arch. Otol., N. Y., April, 1882.

Ein Fall von Diplacusis. Ztschr. f. Ohrenh., Wiesb., 1881-82, XI., 53.

On the Topography of the Human Vestibule. (Trans. by J. A. Spalding.) Arch. Otol., N. Y., 1881., X., 309.

STRAWBRIDGE, G.

Treatment of Inflammation of the Eustachian Tube. Va. M. Monthly, March, 1882.

TAYLOR.

A Case of Necrosis of the Mastoid Portion of the Temporal. Canada Lancet, Toronto, March, 1882.

TAYLOR, R. W.

Death from the use of the Nasal Douche. Med. Herald, October, 1881.

THAULOW, VON.

Taubstummähnlicher Zustand, von Obstruction beider Eustachischenröhren herrührend : Heilung. Norsk. Maga. f. Lægevidenskab., III. R., XI., Bd. 9., H. S. 140.

THEOBALD.

Constitutional Treatment in Diseases of the Ear. Md. M. J., Feb. 15, 1882.

THOMSON, J. F.

Report of Cases Treated at the Ear Dispensary (Edinburgh), from July, 1880, to end of June, 1881. Edin. M. J., May, 1882.

TODD, C. A.

The New Method of Treatment of Chronic Otitis with Discharge. St. Louis Cour. Med., May, 1882.

TUCZEK, F.

Ein Fall von Objectiven, Ohrgeräusch als Ursache von Melancholie. Berl. Klin. Wochenschr., 30, 1881.

TURNBULL, L.

Acute Inflammation of the Auricle (Perichondritis.) M. Bull., Phila., April, 1882.

URBANTSCHITSCH.

Ueber subjective Schwankungen in der Intensität akustischer Empfindungen. Wiener Med. Presse, No. 18, 1882.

USPENSKI, M.

Taubheit, complicirt mit Hysterischer Neuroze und Hysterischer Taubheit. St. Petersburg Med. Wehnschr., 1882, VII., 61.

VOLTOLINI.

Sur l'Examen Anatomo-pathologique de l'Organe de l'Ouïe et particulièrement du Labyrinthe. Trans. Cong. Périod. Internat. d'Otol., 2 Sess., Trieste, 1881, 3.

WEBER-LIEL.

Zur Frage der Einwirkungsweise von Chinin- und Salicylsäure-Präparaten auf das Menschliche Gehörorgan. Monatschr. f. Ohrenh., Jan., 1882.

WEIL, E.

Circumscriphte desquamativ Entzündung, des äusseren Gehörganges. Monatsch. f. Ohrenh., 1881, 3.

Giebt es ein Physiologisches continuirliches Ohrgeräusch. Monatsch. f. Ohrenh., Berl., XVI., 2, Bl. 3, Feb., 1882.

Results of an Examination of the Ears and the Hearing of 5,905 School-children. (Trans. by W. C. Ayers.) Arch. Otol., N. Y., April, 1882.

Vorläufige Mittheilung über die Resultate der Gehör-untersuchung an 4,500 Schulkindern. Cor.-Bl. d. Nied.-Rhein. Ver. f. öff. Gesundheitspflg., Köln, 1881, X., 127.

Sur la Theorie des Bruits Audifs. Ann. des Mal. de l'Oreille, du Lar., etc., March, 1882.

Beitrag zur Lehre von der Ohrgeräuschen. Monatsch. f. Ohrenh., Nov., 1881.

WETTE.

Ein Fall von acuter desquamativer Entzündung des Trommelfells. *Monatsschr. f. Ohrenh., Berl.*, XVI., 2, 2 Bl., Feb., 1882.

WHITE, J. A.

Catarrhal Deafness. *Trans. Med. Soc. Va.*, 1881; *Va. M. Monthly*, Jan., 1882.

WILLIAMS.

Why we have two Eyes and two Ears. *St. Louis M. and S. J.*, April, 1882.

WILSON, F. M.

Drei Modificationen otiatrischer Instrumente. (Uebersetzt von H. Steinbrügge.) *Ztschr. f. Ohrenh., Wiesb.*, 1881-2, XI., 5.

WOLF, O.

Report on the Progress of Otology in the Second Half of the Year 1881. *Physiology of the Organ of Hearing, and Physiological Acoustics. Arch. Otol.*, N. Y., April, 1882.

WOLF, O., and Moos, S.

Ueber Meningitis Cerebrospinalis Epidemica, insbesondere über die nach derselben Zurückbleibenden combinirten Gehörs- und Gleichgewichtsstörungen. *Ztschr. f. Ohrenh.*, X., 4.

Notes.

AMERICAN OTOLOGICAL SOCIETY.—The fifteenth annual meeting of the American Otological Society will be held this year on Tuesday, the 25th of July, at the Fort William Henry Hotel, Lake George. This place may be reached from New York, by trains leaving the Grand Central Depot direct for the hotel, without change of cars; also from Boston, via Boston and Albany, Hoosac Tunnel, and Vermont Central Railroads. Any of these lines will bring passengers to Lake George. The rates at the Fort William Henry Hotel are \$3.00 per day.

With a view of securing an interesting discussion of papers presented at the meeting, the secretary has been requested to ascertain the titles of all papers which may be offered; these titles will be incorporated in the formal call for the meeting to be issued July 1st, and will take precedence on the bulletin over all other papers.

In order that suitable accommodations may be secured, members of the Society are requested to notify the secretary, Dr. J. J. B. Vermyne, New Bedford, Mass., of their intention to be present at the meeting.

BRITISH MEDICAL ASSOCIATION.—Fiftieth annual meeting. Worcester, August 8th, 9th, 10th, and 11th, 1882.

Hitherto at the meetings of the British Medical Association, Otology has been classed merely as a sub-section of Surgery. At the next annual meeting, to be held as above stated, however, a whole section will be devoted to Diseases of the Ear.

A circular is issued by the secretaries of the new section, Drs. J. J. Kirk Duncanson and P. McBride, requesting original papers, short abstracts of which should be sent to them, addressed 20 Alva Street, Edinburgh, not later than July 15th.

The officers of the section are: President, W. Laidlaw Purves, M. D.; Vice-Presidents, George P. Field, M. R. C. S., A. H. Jacobs, M. D., E. Cresswell Baber, M. B.

The second volume of Professor Adam Politzer's "*Lehrbuch der Ohrenheilkunde*" is just issued.

THE AMERICAN JOURNAL OF OTOTOLOGY.

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Original Communications.

THE SENSE OF DIZZINESS IN DEAF-MUTES.

BY WILLIAM JAMES, M. D.,

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PREVENTED by outward circumstances from completing an investigation into the above subject which I would willingly have made more thorough, I publish the facts I have already obtained, in the hope that some one with better opportunities may carry on the work. The regular medical attendants of deaf-mute institutions seem particularly well fitted for such a task.

So far as I can make out, the immunity from dizziness which is characteristic of deaf-mutes has never been remarked or commented on before, even at asylums. Another illustration of how few facts "experience" will discover unless some prior interest, born of theory, is already awakened in the mind.

The modern theory, that the semicircular canals are unconnected with the sense of hearing, but serve to convey to us the feeling of movement of our head through space, a feeling which, when very intensely excited, passes into that of vertigo or dizziness, is well known.¹

¹ For the benefit of possible readers who may not be physiologists I would say that a summary of the evidence for this view is given in Foster's Text-book of Physiology, Book III, chap. vi., § 2. An attack on this theory has recently been made by Baginski, a very full abstract of whose article appeared in the number of this Journal for last January. Baginski's experiments seem to me far from conclusive; and his argument has been satisfactorily replied to by Hügys in Pflüger's Archiv, vol. xxvi., page 558, and by Spamer, *Ibid.*, vol. xxv., page 177.

It occurred to me that deaf-mute asylums ought to offer some corroboration of the theory in question, if a true one. Among their inmates must certainly be a considerable number in whom either the labyrinths or the auditory nerves in their totality have been destroyed by the same causes that produced the deafness. We ought therefore to expect, if the semicircular canals be really the starting-points of the sensation of dizziness, to find, on examining a large number of deaf-mutes, a certain proportion of them who are completely insusceptible of that affection, and others who enjoy immunity in a less complete degree.

The number of deaf-mutes who have been examined to test this suggestion is in all 519. Of these 186 are reported as totally insusceptible of being made dizzy by whirling rapidly round with the head in any position whatever.¹ Nearly 200 students and instructors in Harvard College were examined for purposes of comparison, and but a single one remained exempt from the vertigo. Of the deaf-mutes, 134 are set down as dizzy in a very slight degree; while 199 were normally, and in a few cases abnormally, sensitive.

The surmise with which I started is thus proved, and the theory that the semicircular canals are organs of equilibrium receives renewed corroboration.

Of course the cases observed represent every kind of ear disease, and it is impossible to analyze them so as to show why exemption from vertigo should be associated with the deafness in one case and in another not. "Congenital" mutes are found in all three classes, and so are "semi-mutes," so that the age at which the deafness comes on has nothing to do with it. The diseases which are the most fertile causes of deafness, meningitis, scarlet fever, typhoid fever, etc., are as apt to leave the patient's sensibility to vertigo normal as they are to abolish it.

The cases from which the above aggregate conclusions are drawn are from several distinct sources: the Hartford Asylum; the National College at Washington, and its primary department; the Horace Mann School in Boston; the Clarke Institution at Northamp-

¹ It is well known that with the head leaning forward or backward, or towards one shoulder, the dizziness is much more intense.

ton; the Indiana Institution; the answers to a printed circular I distributed, and a number of separate voluntary reports I received. In tabular form the statistics run as follows:—

Institution.	Not dizzy.	Slightly.	Dizzy.
National College.	18	5	38
Its Primary Department	11	1	19
Hartford	49	49	57
Boston	45	20	4
Northampton	35	30	20
Indiana	6	6	4
Circulars	28	19	46
Various	4	4	11
	186	134	199

Total 519 cases.¹

The same case was often reported through more than one channel. I have tried as well as I could, though I fear without perfect success, to eliminate these reduplications. As regards the accuracy of the reports, there is this to be said. Among normal people it is well known how individuals differ in their sensitiveness to whirling about or swinging. The cases marked "slight" may *possibly* therefore fall within the normal limits. It is more probable however that the majority of them represent a more or less abnormally reduced susceptibility. In the cases I myself examined, every one where the presence of vertigo was at all doubtful was recorded as "slight," so as not to overload the column of figures favorable to my hypotheses. In the Harvard College records, in which each man inscribed his own result, the expressions "slightly" and "somewhat" occur, but they do so very few times indeed. Where the vertigo was slight, it has often happened that a deaf-mute examined one day or by one person

¹ I add the following communication in a note because it is less exactly reported, and the observations were perhaps made more cursorily than those set down in the text. Mr. Fosdick, of the Institution at Danville, Ky., writes in March, 1881: "I selected twenty boys about half of whom had been born deaf, the other half had lost hearing. . . . I applied to them our test in the three ways. . . . With those who had lost hearing from disease the result was uniform. No dizziness could be produced. . . . With those who had been born deaf the results were equally uniform. A few seconds of spinning were in most cases sufficient to produce dizziness."

was reported "not dizzy," whilst another day or another examiner caused the case to be recorded either as "slightly dizzy" or as "dizzy." I am disposed to think that both normal and abnormal subjects differ somewhat in their sensibility to vertigo from one day to another.¹ Löwenfeld says that this is markedly the case with the vertigo induced by galvanic currents across the head, of which I shall have something to say anon.

A certain lack of rigorous accuracy in individual instances ought then to throw no discredit whatever on the main result of the investigation, which is that disease of the internal ear is likely to confer immunity from dizziness. Nobody could possibly confound the extreme cases, nor could any difference of opinion arise concerning them. We see on the one hand an affection which may nauseate the patient or make it impossible for him to stand on his feet at all; on the other, absolute and total indifference to the whirling in every respect whatsoever.

As regards the method of examination, active spinning about on the feet with the head successively upright, bent forward, and inclined on one shoulder, is of course the simplest way of testing the matter. The eyes must be closed to eliminate optical vertigo pure and simple, but opened when the spinning is over, so that the patient may have every advantage for walking straight. Except in the Boston and Northampton Schools this was the method generally used. It is likely to give an unduly small number of total exemptions, from the fact that if the whirling has been long and violent, some feeling of confusion will remain for a few moments as a consequence of head congestion, and some irregularity of gait as a consequence of involuntary continuance of muscular action. This latter may be called muscular vertigo — it probably figures in many of the cases marked "slight."

The muscular vertigo may be entirely eliminated by *passive* rotation. The children of the Boston and Northampton Schools were seated on a square board, each angle whereof had a rope affixed to it. The ropes were kept parallel up to a height above the head of the inmate by a cross-shaped brace of wood which kept them asunder at

¹ Exp. u. krit. Untersuch. zur Electrathérapie des Gehirns, München, 1881.

that point. Above the cross-brace they rapidly converged to the point of suspension of the apparatus. The apparatus is rotated by the examiner's hands till the ropes above the brace are tightly twisted. The child is then seated on the board, with closed eyes, and head in any position desired, and the torsion of the ropes is left to work its effects freely. These consist in a rapid revolution of the whole apparatus, including its inmate. The moment the speed of rotation slackens, the examiner stops the rotation, and sets the child, who has been instructed previously, to open his eyes and walk as straight as possible towards a distant point on the floor. I examined all the Northampton children myself in this way, and (with my brother's assistance) repeated thus the examinations made of the children of the Horace Mann School by their teachers a year before.¹ The Harvard students were also examined in this way.

It is difficult to be sure, in many of the cases marked "slightly dizzy," whether the sensation experienced by the subject was a mild degree of true vertigo, or a slight confusion arising from the effects of centrifugal movement of the intracranial fluids and viscera. That changes of intracranial pressure will give rise to dizziness by directly influencing the brain independently of the semicircular canals is evident from the number of subjects who are of reduced sensibility as respects dizziness from whirling, but who say that they feel dizzy when their head is suddenly raised from a bent position, or when they get up after stooping to the ground. In reply to a question in the circular, "Do you ever experience dizziness under any other circumstances?" [than whirling] two of the "not dizzy" class, six of the "slightly dizzy" class, and five of the "dizzy" class speak of experiencing this feeling.

¹ In a preliminary report of these inquiries published in the Harvard University Bulletin No. 18 (1881), the figures are different from those I give here. The differences are due to later observations. I regret very much that owing to a rather incomprehensible degree of thoughtlessness, it never occurred to me to test the pupils' sense of rotation after the original Crum-Brown and Mach method: that is, to seat them in the swing with closed eyes, to rotate it gently through a comparatively small number of degrees, and to see how accurately they could afterwards assign the direction and amount of rotation. It is to be hoped that any one repeating the observations will not leave this one out. We should expect that non-dizzy deaf-mutes would be quite unaware of the rotation if it were absolutely frictionless and slow.

In the light of all these facts it became an interesting question to ascertain whether the dizziness produced by galvanic currents through the head be due to irritation of the vertigo centres, themselves or of their peripheral organ the semicircular canals. Hitzig, as is well known, made a careful study of these phenomena on normal persons ; it may be found in his "*Untersuchungen über das Gehirn.*" With its theoretical conclusions it is impossible to agree. The objective facts however, which I believe he first accurately analyzed, are these : If the subjects' eyes are open, they move slowly towards the side of the anode when the current is strong, then rapidly recover themselves by a quick movement towards the side of the kathode. At the same time the world appears to swim towards the kathode, and the head and body incline over towards the anode.

At the Northampton School we tested forty-three pupils with a galvanic current strong enough to make four normal adults, on whom it was tried, bend body and head strongly over. Of twenty-three deaf-mutes of the "not dizzy" class, only five showed this phenomenon. Of twenty pupils of the "dizzy" class ("slight" cases were not tried) fourteen showed it in a greater or less degree. At the Boston School the girls became so nervous that the few results I obtained with them were valueless. Of the boys, fifteen "not dizzy" cases were tried, and but one swayed towards the anode. Three "slight" cases were tried ; one swayed, the other two did not. One "quite dizzy" case had the current passed, but did not sway.

With respect to the subjective feelings accompanying the current's passage, they are so numerous and often so intense that a deaf-mute child experiencing them for the first time can hardly be expected to give a very lucid account of them. Stinging of the skin over the mastoid processes, subjective noises (often very loud), flashes before the eyes, strange cerebral confusion, are prominent among them. Nevertheless, it seemed evident that many of the patients whose body did not sway at all and whose eyes showed no perceptible nystagmus, *did* have some sort of a vertiginous feeling, which they expressed by moving the hand wavingly across the forehead, by saying they were "dizzy" or felt like "falling." I regard the experiments, therefore, as almost inconclusive. To be of value they should be

repeated many times with the same subjects on different days, and with non-polarizable electrodes fastened by a spring arc behind the ears, so as to follow the head in its movements without modifying the contact. The current should also be measured, which was not done accurately in the above cases.

Taken as they stand, all I feel like saying of them is that they make it appear *not improbable* that both the vertigo centre and its peripheral organ are galvanically excitable; but that the peripheral organ is much more sensitive to the current than is the centre. There was certainly a marked difference of demeanor, on the whole, between the "dizzy" and the "not dizzy" pupils of the Northampton School, when under the current, even though in many cases the difference were only one of degree.

In view of the great probability that sea-sickness is due to an over-excitement of the organs of vertigo, propagated to the cerebellum or whatever other "centres" of nausea there may be, I inquired of many deaf-mutes whether they had been exposed to rough weather at sea and suffered in the usual way. The majority, of course, had not been exposed. Fifteen of the "not dizzy" or "scarcely dizzy" classes had been exposed, and of these not one had been sea-sick. This, it is true, is negative evidence, and might easily be upset by two or three cases of exemption from dizziness with susceptibility to sea-sickness.¹ As it stands, however, it affords a presumption that non-dizzy deaf-mutes *may, ipso facto*, enjoy immunity from sea-sickness. And it suggests the application of small blisters behind the ears as a possible counter-irritant to that excitement of the organs beneath, in which that most intolerable of all complaints *may* take its rise.

Perhaps the most interesting of all the results to which our inqui-

¹ I have three such possible counter-cases, but in all the record is so imperfect (and no address being given further inquiry cannot be made) that they cannot be used. To question 8 in the circular, "Have you been exposed to sea-sickness and been sea-sick since losing your hearing?" one, forty-two years old, not dizzy, replies, "Yes, but once in my childhood." Another, slightly dizzy, thirty-nine years old, deaf at thirteen years, says, "Was greatly nauseated by my first ride in the rail cars when fourteen years old." The third, not dizzy, writes, "Was on a coast steamer for three days out of sight of land in a storm; felt slightly uncomfortable in state-room, but was all right in the open air of the deck." The state-room sickness may have been due to smell.

ries have led is the following. A certain number of non-dizzy deaf-mutes when plunged under water seem to be affected by an indescribable alarm and bewilderment, which only ceases when they find their heads above the surface. Every one who has lost himself in the woods, or wakened in the darkness of the night to find the relation of his bed's position relatively to the doors and windows of his room forgotten, knows the altogether peculiar discomfort and anxiety of such "disorientation" in the horizontal plane. In ordinary life, however, the sense of what is the *vertical* direction is never lost. Even with eyes closed, and the "static" sense, as Brewer calls it, of the semicircular canals lost, *gravity* exerts its never-ceasing influence on our limbs, and tells us where the ground is and where the zenith, no matter what our movements may be. "So shakes the magnet, and so stands the pole." Helmholtz, who wrote his "Optics" before the semicircular canal sense was discovered, ascribes much of the sea-sick vertigo to the sufferers' sense of the direction of gravity being thrown out of gear: "One feels the traction of gravity [on board ship] now apparently to the right, now to the left, now forwards and now backwards, because one is no longer able to find [with his eyes] the direction of the vertical. Only after long practice, as I can myself testify, does one come to use gravity as an exclusive means of orientation, and only then does the vertigo cease."¹

But imagine a person without even the sense of gravity to guide him, and the "disorientation" ought to be complete, — a sort of bewilderment concerning his relations to his environment in all three dimensions will ensue, to which ordinary life offers absolutely no parallel. Now this case seems realized when a non-dizzy deaf-mute dives under water with his eyes closed. He hears nothing (except perhaps subjective roaring); sees nothing; his semicircular canal

¹ *Physiol. Optik*, page 664. One of my colleagues, an eminent geologist, with a good topographical instinct, tells me that whenever he "loses his bearings" in the country, he becomes nauseated. I myself became distinctly nauseated one night after trying for a long time to imagine the right position of my bed in the dark, it having been changed a day or two previous. These facts seem to show that a purely ideal excitement of images of "direction," when strong and confused, such images being probably faint repetitions of semicircular canal feelings, may engender precisely the same physical consequences as would an equally strong and confused excitement of the canals themselves.

sense tells him nothing of motion up or down, right or left, or round about; the water presses on his skin equally in each direction; he is literally cut off from all knowledge of their relations to outer space, and ought to suffer the maximum possible degree of bewilderment to which in his mundane life a creature can attain.

I have received information bearing on this point, and distinct enough to be quoted, from thirty-three cases in all. Curious exceptions occur which I cannot understand, and which I will presently state. Meanwhile here are some extracts from my correspondents' replies which show the condition above described to be no fiction. Professor Samuel Porter, of the College at Washington, from whom I have derived most of my information on this point, says, "I am told it is the case with some deaf-mutes that they sometimes find a difficulty in rising after a dive from uncertainty as to up and down."

L. G. (not dizzy) writes : —

"A year after I lost my hearing, on a day when the sun was shining brightly, I dove from a high place, and immediately after entering the water had no knowledge of locality. In what direction the top was I could not determine, and it was the same as respects the bottom. I endured agonies in searching for the surface. At last, when I had given up all hope, my head was fortunately at the surface, and I was soon master of the situation. I was told that I had been swimming on the surface with the back of my head sometimes out of water, and at other times completely immersed. For years I could not summon up courage to dive again. I never feel at my ease under water."¹

W. H. (scarcely dizzy) writes : —

"Since I became deaf it has been difficult to control myself under water. . . . When I undertake to dive into the water I immediately lose all control over my movements, and cannot tell which way is *up* or which is *down*. . . . Once I struck against something, but I am not able to say whether it was the bottom of the river or the steep rocks near the shore."

A. S. L. (not dizzy) : —

"If I get my head under water it is impossible for me to tell which is the top or bottom of the river or pond, and there is a great roaring and buzzing in my head."

G. M. T. (not dizzy) : —

"Before I lost my hearing I was a good diver, but after that time I could never trust my head under water."

¹ Says eyes were closed.

M. C. (not dizzy) : —

"Difficult to swim or dive without being frightened terribly. . . . I generally close eyes till under water, then open them till top is reached. If eyes are kept closed I become confused."

J. L. H. (doubtfully dizzy) : —

"It is very seldom that any deaf-mute can escape drowning when his head has got under water. Persons with such heads as mine are rendered unable to come out of the water in the right direction."

J. C. B. (not dizzy) : —

"Dare not go under water at all unless by day and with eyes open. . . . Must keep the eyes open. Impossible to swim in the dark."

C. S. D. (not dizzy) : —

"Can't dive at all. As soon as water gets in my eyes, I can't get them open ; get confused, and do not know whether I am standing on my head or my feet."

A. B. (not dizzy) : —

"Gets perfectly bewildered under water. Dives with closed eyes."

C. P. F. (not dizzy) : —

"I undertook on one occasion to turn a summersault in water only two feet deep. It was done in such a way that I came down on my hands and knees on the bottom with my head under water. Instantly I seemed to be in water fathoms deep, facing a cliff which I was trying to climb up with my hands and feet. I pawed and pawed but could not rise, neither could I sink. There was no sensation to prove to me that I was in a horizontal position; every sensation was that of standing upright in water above my head. It seemed hours before I could climb that cliff, though it was only a second or two before my pawing brought me into water so shallow that my head appeared above the surface. Instantly the sensation of being in an upright position vanished, and I felt myself to be where I really was, on my hands and knees in the water."

Of this class of cases there are fifteen out of the thirty-three. The remaining ten "not dizzy" say they can dive perfectly well. Two of them report that they do so equally well with eyes closed or open, and of two others Professor Porter sends me the same account. Of the residual eight there are five normal as respects dizziness. One complains of losing equilibrium, another of turning giddy, a third of "not knowing which way I am going," a fourth of "losing presence of mind," the fifth of having "lost power of directing movements." Closer inquiry of this last case showed that the perplexity only happened once, and that its cause was then the bright sunshine

on the bottom of the bathing tank which he mistook for the light of the sky.¹

Finally three cases, "slightly dizzy," complain of noises in the ears, and peculiar feelings which make diving difficult of performance.

Obviously the conditions are very complicated. In the eight last cases the symptoms might be due (in all but the fifth) to the entrance of water through a perforated tympanum. This is well known to cause both dizziness and roaring, but the presence of tympanic perforation in the subjects in question is unknown. It is impossible to say whether some of the "bewilderment" of the first fourteen may not be due to this cause, but as they report themselves "not dizzy" to whirling, this seems in the main unlikely.

The intermediate class of ten "not dizzy," four of whom we know to be able to dive with closed eyes without being bewildered, is the hardest to deal with, and threatens even to upset our pretty little theory. The only reason why we do not immediately confess that it does so is the suspicion (always possible) of some error in the report, which a minute personal examination would reveal. I can therefore only hand the matter over to those with opportunities for investigation, as an as yet unsolved mystery upon which it is to be hoped, they may throw some farther light.

A noteworthy fact (which shall be immediately explained) is that the non-dizzy patients who got bewildered under water were all more or less afflicted with ataxia or some other disorder of movement. A natural explanation of their trouble would then be that they had simply lost control of their limbs for swimming movements. This may be true of some: two report trouble under water soon after loss of hearing, but not now, the ataxia having meanwhile improved. But the ten non-dizzy who *can* dive happen also all to be ataxic. So that ataxia *per se* cannot be held to be an all-sufficient reason for the phenomenon in question.

The reason for the great predominance of locomotor disorders in

¹ The same cause seems to have increased the bewilderment of Mr. L. G. on the occasion described in the first quotation above (page 247). He informs Professor Porter that he always keeps his eyes open under water, and that they were open on that occasion. He speaks of the sun shining brightly.

the persons who answered my circulars is this : one of the first things I discovered on beginning my inquiries was the fact, notorious at deaf and dumb institutions but apparently not much known to the outer world, that large numbers of deaf-mutes stagger and walk zig-zag, especially after dark, and are unable to stand steady with their eyes closed. To such deaf-mutes as these were most of my circulars purposely sent. I do not refer to the awkward gait and shuffling of the feet which are so commonly exhibited at asylums,¹ but to a real difficulty in controlling their equilibrium. Congenital deaf-mutes appear hardly ever to show this peculiarity. I have only heard of two or three cases of their doing so. The bulk of those that stagger were made deaf by scarlet fever or some form of meningeal inflammation. When the facts first began to come in I naturally thought that the staggering,² which usually improves in course of time, might be due to the loss of the afferent sense most used in locomotor muscular coördination, supposing the semicircular canal feelings to constitute this afferent sense. In the preliminary note published in the Harvard University Bulletin, I wrote as follows : —

“ The evidence I already have in hand justifies the formation of a tentative hypothesis, as follows : The normal guiding sensation in locomotion is that from the semicircular canals. This is coördinated in the cerebellum (which is known to receive auditory nerve fibres) with the appropriate muscles, and the nervous machinery becomes structurally organized in the first few years of life. If, then, this guiding sensation be suddenly abolished by disease, the machinery is thrown completely out of gear, and must form closer connections than before either with sight or touch. But the cerebellar tracts, being already organized in another way, yield but slowly to the new coördinations now required, and for many years make the patient's gait uncertain, especially in the dark. Where the defect of the

¹ This seems little more than a bad habit produced by two causes : (1.) When they walk with each other their eyes are occupied in looking at each other's fingers and faces, and cannot survey the ground which then is, as it were, explored by the feet ; and (2.) Their deafness makes them insensitive to the disagreeable noise that their feet make.

² Moos, quoted by McBride (*Edinburgh Medical Journal*, February, 1882), says the staggering is cured in twenty-seven months after cerebro-spinal meningitis. I find it to have often lasted much longer.

auditory nerve is congenital the cerebellar machinery is organized from the very outset in coördination with tactile sensations, and no difficulty occurs. To prove this hypothesis a minute medical examination of many typical cases will be required. If this prove confirmatory, it will then appear probable that many of the so-called paralysees after diphtheria, scarlet fever, etc., may be nothing but sudden anæsthesiæ of the semicircular canals."

The minute medical examination I spoke of, I have been prevented by circumstances from making or getting made. What ought to be done would be to carefully test the staggering patients for such anæsthesiæ of the body or limbs, losses of tendon reflex, and various locomotor symptoms of ataxia, as would show the presence of central nervous disorder independent of the labyrinthine trouble, but joint results with it of the disease that left the subject deaf. If a certain residuum of patients were found without any signs of such nerve-central disorder, the hypothesis quoted would receive corroboration. I must confess, however, that the very large number of staggering and zigzagging deaf-mutes, who are *free* from any labyrinthine lesion (as evidenced by their being normal as respects dizziness), and whose cases have been made known to me since the preliminary report was written, make it seem plausible that the ataxic disorders usually flow directly from lesions of the locomotor centres, sequelæ of the meningitis, scarlet fever, or whatever other disease the patient may have had. Whether they do so exclusively cannot now be decided. I know of no more interesting problem for a physician with good opportunities for observation to solve, than that of the relation of the semicircular canal sense to our ordinary locomotor innervation. And certainly fresh cases of deafness coupled with loss of sensibility to rotation seem the most favorable field of study.

It has been suggested, I no longer know by whom, that the mysterious topographic instinct which some animals and certain classes of men possess, and which keeps them continuously informed of their "bearings," of which way they are heading, of the "lay of the land," etc., might be due to a kind of unconscious dead reckoning of the algebraic sum of all the angles through which they had twisted and turned in the course of their journey. If the semicircular canals

are the organs of sensibility for angular rotation, the abolition of their function ought to injure the topographic faculty. I accordingly asked in my circular the question: "Have you a good bump of locality?" A rather stupidly expressed phrase, but one which I supposed would be popularly intelligible. Forty-seven persons, not dizzy, or scarcely dizzy, answered this question distinctly, forty with a "yes," and seven with a "no." So that in this (truly vague enough) matter, my inquiries give no countenance to the suggestion alluded to.¹

"Dizziness" on high places was also made the subject of one of my questions. This feeling, in those who experience it normally, is a compound of various muscular, cutaneous, and visceral sensations with vertigo; and of course the answers of my correspondents, not being of an analytical sort, would be of very little value, even were they much more numerous than they are. They stand as follows:—

"Are you dizzy on high places?"

Of those not or scarcely dizzy on whirling, sixteen say "yes," twenty-nine "no."

Of those dizzy on whirling, twenty-nine say "yes," and fourteen "no."

Taken in their crudity these answers suggest the bare possibility that anæsthesia of the semicircular canals *may* confer some little immunity from that particularly distressing form of imaginative weakness. The centres of imagination of falling may grow weak with the disuse of the sense for falling, and the various reflex results (feelings in the calves, hypogastrium, skin, respiratory apparatus, etc.), which help to constitute the massive feeling of dread, not following upon the sight of the abyss, as they normally should do, the subject may remain cool-headed, when in former times he would have been convulsed with emotion.

One more point, of perhaps greater interest. The following letter from Dr. Beard, of New York, speaks for itself:—

¹ In a long and interesting article in the *Revue Philosophique* for July, 1882 (*le Sens de l'Orientation et ses Organes*), M. C. Viguier maintains the view that the semicircular canals are organs in whose endolymph terrestrial magnetism determines induced currents which vary with the position of the canals, and (apparently) enable the animal to recognize a lost direction as soon as he finds it again. Clever and learned as are M. Viguier's arguments, I confess they fail to awaken in me any conviction that their thesis is true.

NEW YORK, July 2, 1881.

DEAR DR. JAMES, — Acting upon your suggestion, I have succeeded in abolishing the sense of vertigo in my trance subjects. I have accomplished this in two ways. First, by means of the swing which you have used in your experiments. I find that persons when put into trance sleep and placed in a swing which is twisted up tightly, so that it untwists rapidly, and for a considerable time, feel no dizziness or nausea, but when brought out of the trance, at once walk away without the least difficulty.

I find — as you did — that the great majority of individuals cannot in the normal state do this; but are made very dizzy and sick, and sometimes even fall out of the swing.

Secondly, by having the subject look at some limited space on the ceiling, holding his head up, and turning around rapidly four or five times. Scarcely any one can do this, in the normal condition, and walk off straight. They will stagger, as though intoxicated or suffering from ataxia. These trance subjects, when put into that condition with their eyes open, can go through this test, and immediately walk off without any difficulty whatever.

These experiments — I may say — have been witnessed by a large number of physicians in this city, and have been confirmed independently by some of them. There is no difficulty in confirming these experiments, when you have trained subjects to coöperate with you.

I regard these experiments as of a demonstrative character; that is, as belonging to the class of experiments that prove the genuineness of the trance phenomena, since there are very few indeed who can simulate them.

I have no doubt whatever that sea-sickness could be cured entirely by putting persons into trance.

Yours, truly,

GEORGE M. BEARD.

Finally, (to wring the last drop from an inquiry which, however slender may be its basis of fact, will be accused by no one of not having had the maximum possible number of theoretic conclusions extracted from it!) I will subjoin the following extract from one of my correspondents' letters as a crumb for vivisectional physiologists to whom the fact narrated may be unknown: —

"If a dog *grows up* and his tail is cut off suddenly, he staggers so badly he cannot cross a foot log."¹

To all my correspondents I owe thanks for the facts imparted in this paper. Without the most painstaking coöperation of Professor Samuel Porter, in particular, it could hardly have been written. To

¹ Experiment made by a preacher in East Tennessee, a friend of the writer.

Principal Williams, of the Hartford School ; Miss Fuller, of the Boston School ; and Miss Rogers, of Northampton, my best thanks are also due. Dr. J. J. Putnam has assisted me with counsel and aid in the galvanic observations. Dr. Clarence J. Blake examined the condition of the ears of the Northampton children, but not being able to deduce any conclusions relevant to my own inquiry from his observations, I leave them unrecorded here.

THE USE OF SOFT INDIA-RUBBER DRAINAGE
TUBES IN CHRONIC SUPPURATIVE INFLAMMA-
TION OF THE TYMPANUM, WITH NARROWING
OR CLOSURE OF THE MEATUS EXTERNUS.¹

By OREN D. POMEROY, M. D.,

NEW YORK.

AT the New York Foundling Asylum, during the past few years, I have noticed a tendency in the cases of chronic suppurative ear affections in young children to closure of the meatus externus, so as to make treatment of the tympanum difficult and often impossible. To obviate this trouble I have resorted to incision of the canal with the hope of widening it, so that the tympanum might be reached by our cleansing processes and for the purpose of making applications. This has signally failed. Again I have incised the auricle at its insertion posteriorly, so as to make an opening with some directness into the tympanum for purposes of drainage. This, also, has not met with satisfactory success. After a time Dr. Chadbourne, formerly house physician to the asylum, suggested the introduction of India-rubber tubes into the meatus, so as to drain away the discharge from the tympanum, and also to allow of applications to be made. This plan has been found to succeed admirably. The softened and boggy condition of the canal has, by the elastic pressure of the tubing, given way, assuming after a while a natural appearance. The tendency of the canal to discharge through the great relaxation and ulceration of its walls has been diminished; the ichorous nature of the discharge, which often produces grooves in the canal by its corrosive action, is by the rubber tube prevented from doing harm in its exit from the ear. Polypi of the canal have been absorbed by the pressure of the tube, and altogether its action has been satisfactory. I cannot say that I have met with many of these cases in private practice, or in that of other hospitals, but here it is frequently met with.

¹ Published also in the Transactions of the American Otological Society.

When the tube is inserted the ear may be cleansed very thoroughly by simply syringing through the tube, and afterwards, if necessary, may be wiped out with a piece of cotton wool on a probe. After using a tube of a given size for a few days or weeks, a larger one may be substituted, and so on, until the canal has reached its normal size, or until the patient is convalescent. A rather soft variety of tubing is preferable; the black tubing which is imported, or the red tubing which is made here. The ordinary white tubing made in this country is usually too hard and inelastic to be useful; it acts as an irritating foreign body, and does not exert the necessary peculiar mild and elastic pressure upon the walls of the canal. At first the smallest-sized tubing, about two or three lines in diameter, may be selected, as in some cases the canal will be entirely closed. To properly introduce the rubber tube it must be stretched so as to be diminished to a very narrow diameter. To effect this a wire is passed through the tubing, so as to catch the latter near its extremity, then pushed onwards forcibly, until the tube, by being stretched, is reduced nearly to the size of the small but stiff wire we have selected. It is then held in that position and gently pushed into the meatus until the tympanum or the remains of the membrana tympani are reached; then with the wire still in position, the tube should be released at its outer end when, by its elasticity, it will draw itself into the meatus, thus restoring itself nearly or quite to its original calibre. The wire is then withdrawn and the tube cut off at the base of the concha (both the wire and the rubber should be smeared with vaseline). If necessary to remove the tube a pair of forceps will easily accomplish this. After a while it will not be necessary to introduce the tube in this manner, which is somewhat difficult of performance, when it may simply be pushed into the ear either with a probe passed through the tube to stiffen it, or even without this aid. Wires of different sizes may be used, and the extremities notched so as to catch the rubber, or the end may be simply cut off at right angles. In very small children I have found that the tube requires to be cut off very short, or the patient will catch hold of it and pull it out. In order to treat the granulations and polypi of the tympanum, the tube must be removed. After a while the canal will be found large enough to

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accomplish this. The following cases may serve to illustrate the subject:—

CASE I. — Nettie, aged six years, has a chronic suppuration of the left ear of four years' duration. Has had most of the infantile diseases. The cause of the aural disease is not known. Has had little benefit from treatment.

On April 25, 1879, her condition was as follows: Discharge from the ear profuse and very offensive, meatus so narrow as hardly to admit the passage of the cotton holder (about one half a line in diameter). At times it is altogether closed. The auricle, glands of the neck, parts about the ear, together with the connective tissue of the neck in the vicinity of the ear, much swollen. The head is turned to the right and cannot be readily moved unless with the body. There is a pustular eczema above and behind the auricle which has produced a number of ulcerations.

A small-sized piece of rubber tubing was drawn over the cotton holder and introduced into the meatus as has already been described. There was no difficulty in cleaning the ear thoroughly by syringing through the tube. Antiseptic and astringent washes were used. Inasmuch as the discharge seemed to excoriate the concha and other parts of the auricle, a mass of carbolized absorbent cotton was placed upon the auricle, and whenever it became at all moistened with the discharge it was replaced by a fresh piece. The plan worked admirably, and the canal rapidly returned towards a normal condition.

After one week the tube was removed; the canal was then about the size of a No. 6 gum elastic catheter, and looked very natural; swelling about the ear much diminished, the eczema drying up; discharge from the ear profuse. The tube was replaced without the aid of the probe. After two weeks the tube was again removed; swelling of the parts nearly disappeared, and the discharge much diminishing. This was worn until the end of the third week, when a larger one was easily inserted.

One washing a day was sufficient to keep the ear clean. This treatment was continued for two months, when the child went to the country, wearing the tube in the ear, although the discharge had ceased. After three months the child was returned to the asylum still wearing the tube. It seemed to have almost grown into the part, but it was easily removed, and the canal was found to be of normal size and appearance.

CASE II. — Richard, aged four years. Previous history unknown; is of a strumous habit. April 30, 1879, has otitis media suppurativa of the right ear, with suppuration of the mastoid cells. All the tissues and glands about the right ear are very much swollen and œdematous. The right tonsil half fills the fauces, causing gurgling respiration. The meatus and side of the neck are ulcerated by the irritation of the discharge. The meatus is nearly closed at a point half an inch from the free border of the canal. The drainage tube was inserted in the same manner as in the first case, and the same treatment was adopted.

The mastoid cells were opened, and a free discharge of offensive grumous pus followed. At the end of the first week all of the symptoms were improved. The swelling of the auricle, neck, and tonsil were all diminished.

The treatment was continued for four weeks, when dead bone was discovered and removed. After this the discharge became gradually less, and at the end of three months it ceased and the tube was removed. There was no recurrence of the disease until fourteen months afterwards, when he had measles. There was a slight discharge for a short time requiring no treatment. Canal perfectly normal.

CASE III. — Clarence, aged five years, has had measles, scarlatina, and pertussis. A suppurative otitis dates back for a period of two years. Has been in one of the hospitals, and pronounced incurable without an operation on the ear. August 20, 1879, he is in very poor condition. Extensive swelling of all the tissues about the ear. Discharge very fetid from dead bone, which is easily discovered with a probe. Meatus nearly closed, and bleeds profusely when touched with an instrument.

The tube was inserted as in the previous cases. It caused considerable pain at first. Discharge very profuse, the cotton and disinfecting solution being used as in the first case. At the end of three days the tube was removed, and the canal found to be large enough to allow of the removal of several spiculæ of bone with the ear forceps.

The tube was easily replaced and allowed to remain for two weeks, when the swelling had nearly disappeared, although the discharge was still profuse but not offensive. At the end of the third week more bone was removed, and a larger tube was inserted. The ear was now only cleaned in the morning. At the end of six weeks the tube was removed, leaving the canal healed, and fully as large as normal. There was a slight return of the discharge at intervals for several months.

CASE IV. — Joseph, aged four years. On June 28, 1879, there was eczema of the right auricle and adjacent parts of the face, neck, and scalp.

The lobe of the ear was very œdematous. The meatus was nearly closed from swelling of its walls, and excoriated from the discharge.

The latter was profuse and offensive. The smallest-sized drainage tube was inserted. In three days the canal had dilated so that the tube fell out; canal healing.

Larger tubes were subsequently introduced. On July 24th the walls of the meatus were healed, and the canal was of normal size; discharge slight and unirritating. The œdema of the eczematous parts had disappeared; patient discharged.

CASE V. — Gussie, aged four years. Otitis media chronica for the past year. The meatus was of large size, and the tube was used simply to protect the parts from irritation. An acute exacerbation was rapidly developing; there were

granulations in the meatus. In two weeks the discharge had lost its ichorous character, being thick and scanty. The tube was removed, and the walls which had contained granulations were completely healed.

CASE VI. — Honorine, aged four years, had double otitis media chronica, with an acute exacerbation in the right ear; meatus almost closed.

There was eczema of the auricle with great œdematous swelling. The ear was very painful, and bled at the slightest touch in consequence of granulations. The wall of the meatus was excoriated, and presented a macerated appearance. The smallest-sized tube was inserted with difficulty. In two days it had dilated the meatus so that it fell out. Subsequently larger-sized tubes were inserted, until the normal size of the canal was reached. At first the tubes seemed to cause some pain, and the patient would remove them.

After six weeks of treatment the patient was cured, the granulations having entirely disappeared.

CASE VII. — John, aged three years. Otitis media suppurativa chronica, following scarlatina. The meatus of the right ear was one millimeter in diameter only. On June 20th the smallest-sized tube was inserted. The excoriations, which had previously existed in the meatus, healed in three weeks, and the tube was removed in six weeks; discharge slight; canal of normal calibre.

Moderate contraction of the canal has since taken place.

The drainage tube has been used in other cases subsequent to these, and in every instance much more prompt recovery has taken place than when other methods have been employed.

Gelitte, in the *Annales des Maladies de l'Oreille*, 1879, No. 5, reports the use of a rubber drainage tube, which was passed through an opening in the mastoid cells and emerged from the tympanum through the meatus.

Schwartzæ, in his mastoid operations, uses a rubber drainage tube in the meatus. I fail to find any notice of rubber drainage tubes used precisely as here specified.

The mode of action of this tube has been already perhaps sufficiently stated.

It is worthy of note that the tube is not perforated as in other rubber drainage tubes. The reason for this is obvious; to protect the meatus absolutely from the ichorous discharge which is the cause of the diffuse inflammation of the canal, and which leads to narrowing from swelling, consequent on the infiltration of its subcutaneous connective tissue, with inflammatory products, principally of a serous nature.

The presence of polypi in the canal is easily explained, from the ulceration of the canal consequent on the corrosive action of the discharge. I believe the canal has its calibre restored more in consequence of the subsidence of the inflammation than from any dilatation afforded by the tube, although the latter factor is not without influence. There seems no question, but that the granulations are removed by the presence of the tubes acting in accordance with well-known laws.

For most of the above cases I am indebted to the former House Physician of the Asylum, Dr. Chadbourne, and to the present incumbent, Dr. Kortright.

CHRONIC OTITIS MEDIA PURULENTA: ITS TREATMENT IN THE PRESBYTERIAN HOSPITAL, PHILADELPHIA.

SERVICE OF DR. C. H. BURNETT.

REPORTED BY THOMAS A. DOWNES, M. D., ASSISTANT.

THE following cases are taken from the Case Book of the Ear Dispensary of the Presbyterian Hospital, Philadelphia, to show the method there used in the treatment of chronic otorrhœa.

I. February 1, 1882. Miss K., aged twenty-one years, has had an offensive discharge from the left ear since infancy. Health otherwise good. Examination shows a large perforation, leaving a narrow peripheral rim of membrane with the short process only *in situ*. After gently syringing with lukewarm water and drying with absorbent cotton, enough calendulated boracic acid [formula¹ of Dr. Sexton] was blown in to fill the auditory canal up some distance from the bottom. This was done three times a week, the patient in the intervals having her ear syringed at home with warm water.

March 27th. The discharge decreasing, and the powder accumulating in the ear. This was removed carefully with curette, and just enough blown in to dust the parts.

May 1st. No discharge for some weeks past; only a slight degree of moisture. Ulcerated wall of tympanum healed. Can hear words when spoken plainly and slowly.

II. May 1, 1882. David F., aged four years. A stout, healthy looking child. His mother states that both ears have been running for two years. The discharge is offensive and abundant. On examination after washing the ears out, a perforation is found in each membrana tympani, anterior to the malleus near its lower end. The calendulated boracic acid was blown in, in sufficient quantity to partially fill the canal. The mother was instructed not to touch the ears for a day, and then simply wash them out gently with a syringe.

May 10th. Much less discharge. The ears mopped out with the cotton probe.

¹ Dr. Sexton's formula:—

R Tr. calendulæ f3i; ac. boracici 3i.

M. and expose for evaporation. Take one drachm of this and two drachms of ac. boracic. and rub up into an impalpable powder.

The powder has a tendency to accumulate and retard the outward flow of the discharge. Reduce the quantity of powder insufflated to just enough to thoroughly cover the diseased surface.

June 12th. The discharge has ceased for over two weeks. Ears dry. Hearing apparently normal in each ear.

III. May 19, 1882. Mrs. R., aged thirty-eight years. Married. General health good. Left ear has been running for past twenty-nine years, since an attack of measles. Has had a variety of treatment, both regular and irregular, without benefit. Husband objected to having the discharge cured as "it might go through the system." After cleansing well with the cotton probe, an old exostosis about as large as a split pea on the posterior superior wall of the canal was seen projecting over, and partially concealing, an abrasion on the wall of the tympanum. Membrana tympani destroyed, excepting a small portion attached to the short process.

Could hear the large tuning-fork some two inches from the ear, and single words when spoken distinctly and slowly about two feet off. Calendulated boracic acid was blown in, and the patient advised to let her ear alone. She reported regularly, being encouraged, much to her surprise, by the decreasing of the discharge.

July 3d. No discharge; some moisture. The old accumulated powder was cleaned out, and only enough blown in to cover the discharging surface.

August 23d. Has been to the country for some weeks. No moisture in her ear, and the diseased surface healed. Hearing same as at previous measurement.

IV. August 7, 1882. Robert P., aged eight years. A well-nourished healthy looking boy. Had scarlet fever when thirteen months of age, leaving him with running ears. Discharge very profuse and offensive. During the past four months his ears have bled at times and ached violently.

Very deaf. Countenance gradually assuming that vacant, peculiar expression so often seen accompanying deafness.

On examination after syringing the right ear, two polypi are seen posterior to malleus and near the membrana flaccida, which were removed with polypus snare. Slight bleeding. The ear was then syringed out, and the pedicles were carefully touched with chromic acid on cotton probe. The canal was then filled with calendulated boracic acid. The left ear was then well mopped out with absorbent cotton, and filled with the same application as the right ear.

August 18th. Discharge has ceased from the right ear. Membrana tympani perforated; the hearing decidedly better. Extracted two polypi from the left ear, situated at the short process. Touched the pedicles with chromic acid; insufflated calendulated boracic acid.

August 29th. But little discharge from left ear. Hears well in it. Continue calendulated boracic acid.

Remarks. — Dr. Burnett, in otitis media purulenta chronica, uses the syringe to clean the ear when the discharge is profuse, as being the quickest and most thorough method, and cotton on a probe when the discharge is slight. Insufflation by means of a blow-pipe of one foot of flexible rubber tubing fitted with two or three inches of goose-quill for taking up the powder and conveying it into the speculum, and the meatus of the auditory canal, is used in applying powder to the ear. After slight practice, the facility and efficiency of insufflation is very gratifying. At first, enough powder is used to partially fill the auditory canal. Packing or tamponing is avoided. As the discharge decreases, the quantity of powder is reduced, until the quantity used amounts to enough to simply dust the diseased parts. Patients are directed to keep the ear clean by syringing between their visits to the dispensary when the discharge is copious enough to run out, otherwise to let their ears entirely alone.

FURTHER OBSERVATIONS ON THE USEFULNESS OF CHINOLINE SALICYLATE IN OTORRHOEA.

By CHARLES H. BURNETT, M. D.,

PHILADELPHIA.

IN Vol. IV., No. 2, of this JOURNAL, April of this year, the nature of salicylate of chinoline and its usefulness in the treatment of otorrhœa were stated in a preliminary communication by the writer, after a trial in several cases in private and in hospital practice.

Although the employment of the drug in the form of an undiluted powder had not been attended by any unpleasant symptoms, in any case, at the time of writing the first communication concerning this valuable remedy, since then, in several cases, the insufflation of the pure powdered chinoline salicylate has been followed by some sensation of heat and even burning, which, however, soon passed away without exciting any inflammation.

The pure powder of salicylate of chinoline was tried in two cases of the worst forms of otorrhœa procurable; viz., in two deaf-mutes, one with chronic purulent otitis media in the right ear, and the other with this disease in both ears. Under the use of the chinoline salicylate both cases became much better; the odor disappeared entirely from one case, that with a single ear diseased, and became much less in the one affected in both ears.

As, however, in both of these cases, the patients stated that there was some discomfort, as described, in their ears, after the insufflation of the chinoline salicylate, and also, as in another case, a girl, twelve years old, with chronic suppuration of the right ear after diphtheria, a burning was caused by the use of the pure powder, I determined to dilute it with boracic acid. This was therefore done by adding one drachm of chinoline salicylate to one ounce of very finely powdered boracic acid. And let me say here that I have not been able to obtain from any one finer triturations of boracic acid than from McKelway, 1410 Chestnut Street, Philadelphia.

The greatest possible trituration of a powder is demanded in that to be used by insufflation in the treatment of aural diseases, because by the fineness of trituration the powder causes less mechanical irritation, adapts itself more closely to inflamed spots, like crevices, cracks, or small deep ulcers, and a less quantity is necessary: thus the ear escapes being clogged. In no case have I found it necessary to fill the entire auditory canal with powder. If the entire wall of the canal is diseased it is necessary to dust it, but not to pack the calibre. If only the fundus is diseased, — *i. e.*, the region of the annulus tympanicus, or the membrana tympani, or its remnant, together with the exposed mucous membrane in the diseased tympanic cavity, — then only these parts need be dusted, either by putting powder on by the cotton tuft somewhat as toilet powders are put on by a “powder puff,” or, as I prefer, by means of a blow-tube. This is best made of a foot of black rubber tubing and a goose-quill cut blunt at the distal end for taking up the powder and carrying it to the ear-funnel. When this is done under good illumination by the forehead-mirror, the quill being held in the speculum, as one would a short pen, aim is easily taken, and by a gentle puff the powder is sent evenly and effectually over the diseased surfaces. In my experience the use of powders for the cure of otorrhœa takes precedence over “drops,” a conclusion to which many other aurists have come. The patient with otorrhœa now fares best who is told to let his ear alone at home, and to see his physician daily until the discharges begin to diminish. The surgeon should cleanse the ear by cotton on the holder rather than by syringing, and he should apply all the local medication. This should consist in insufflation of powders, unless it is necessary to remove a polypus, or to cauterize the ear by solutions of nitrate of silver, or by chromic acid, or by any other escharotic. The silver solutions may be instilled into the ear, but all other caustics must be conveyed in very small quantities, and by the most skillful fingers, under the most complete illumination, and with full view of the diseased spot about to be touched. After the use of caustics of any kind in the fundus of the auditory canal an insufflation of boracic acid should be made, as a kind of antiseptic dressing to the diseased surface.

So far as the salicylate of chinoline is concerned, it has proven itself to be a most valuable adjuvant to boracic acid.

THE PROGRESSIVE GROWTH OF THE DERMOID COAT OF THE MEMBRANA TYMPANI.¹

By CLARENCE J. BLAKE, M. D.,

Boston.

THE fact of a progressive movement of the dermoid lining of the external auditory canal and of the outer coat of the membrana tympani in its process of growth is sufficiently well recognized, and any value which this communication may possess lies in its attempt to more accurately define the character or direction of this movement. The importance of a process which shall not only rapidly repair a tissue in active service as part of a structure constantly exercised in vibration in the transmission of sound, but shall also provide for the uniform removal of all effete tissue, is evident. That this is accomplished by a movement, superficially, of the lining of the external auditory canal, from within outward, has been remarked by several writers, and is a matter of daily observation among aurists, and that this movement includes also the outer superficial coat of the membrana tympani is well known; but, so far as I am aware, no attempt has been made to map out the direction of this movement in the manner herewith described.

The application of paper disks to cover small perforations of the membrana tympani, as described in a paper read by the writer at the meeting of the First International Otological Congress in New York in 1876, led to the observation that these disks, instead of finally detaching themselves and falling off, followed a more or less definite course, which brought them, at the end of a period varying from one to three weeks, to the periphery of the membrane, and eventually to some point on the wall of the canal, whence, when removed by means of the forceps, they brought away, firmly adherent to them usually, a thin film of epidermis.

¹ Read at the Annual Meeting of the American Association for the Advancement of Science. Section F. Montreal, August, 1882.

This observation, frequently repeated, led to a series of experiments, now extending over a period of about five years, upon the healthy membrana tympani, and of which the diagram herewith presented represents, as it were, briefly, the summary of results.

The observations were conducted as follows: Small disks, of about the size represented in the diagram, were cut from thin, double-sized foreign post or note paper, dipped in water, caught one at a time upon the end of a fine cotton-tipped bent wire probe (care being taken not to touch them with the fingers on account of removing the sizing), carried into the ear under good illumination, and successively brought into contact with the membrana tympani, to which they immediately and firmly adhered, the warmth of the surface quickly setting the sizing, in the several positions, as nearly as was possible in each case, indicated in the diagram. At intervals of from two to five days the ear was examined, and the movement of each disk recorded on a drawing, the cumulative results of a large number of such drawings being here represented.



The disks placed just posteriorly to the malleus usually made a nearly straight line toward the posterior superior periphery of the membrane, their lines of movement coinciding after they had passed the periphery and reached a point varying from two to five millimetres distant from the periphery, upon the wall of the canal. The disk placed at the tip of the malleus described a slight curve, and followed the line of its predecessors, but without overtaking them, being usually from one to three days longer in reaching the periphery.

The third disk, placed in front of the tip of the malleus, instead of reaching the periphery by the shortest route, described, in the great majority of the cases, after what appeared to be a period of hesitation, a still larger curve, and made its way also toward the posterior superior periphery, from three to five or more days in the rear of the first disk. The disk placed in front of the malleus about half way between the tip of the manubrium and the short process made its way, more slowly than the others, however, in a nearly straight line toward the anterior superior periphery, where, once arrived, it

either continued directly outward along the superior wall of the canal, finally trending, however, slightly toward the posterior wall, or described the curve indicated in the diagram, passing over the superior border of the membrane of Shrapnell; as the majority, though a very small one, of the disks placed in front of the malleus, chose this latter course, it is so represented here.

From these observations it would seem that the most rapid clearing away, so to speak, of the dermoid coat of the membrana tympani occurs in that portion of the membrane the integrity of which is most important to its function of vibration with the malleus, and that the most vigorous progressive outward movement of the lining of the canal occurs in the same line.

In following the course of the paper disks along the canal, moreover, it is found that from the posterior superior periphery of the membrana tympani outward they describe a curve coming downward upon the posterior, and even upon the posterior inferior wall of the canal, by the time that they have reached a point corresponding to the junction of the osseous and cartilaginous portions of the canal, at which point their further outward progress is usually terminated by the separation of the thin epidermal layer from the surface beneath.

This simple experiment is so easily made that I hope that the observation will be repeated by others, to the end of either confirming or correcting the results here briefly given.

AMERICAN OTOLOGICAL SOCIETY.

THE fifteenth annual meeting of the American Otological Society was held at the Fort William Henry Hotel, Lake George, N. Y., on Tuesday, July 25, at 10.30 A. M., the President, DR. J. ORNE GREEN, in the chair.

There were present nineteen members and four by invitation, who were requested to participate in the discussions. Four new members were elected in the Society and the names of five candidates for membership were referred to the proper Committee.

Morning Session. — After transacting the ordinary routine business, the Business Committee of the Society reported the bulletin of papers to be presented in the following order : —

DR. O. D. POMEROY, of New York, read a paper on

DRAINAGE TUBES IN SUPPURATIVE OTITIS MEDIA,

which is given in full in this number of the JOURNAL.

The discussion of Dr. Pomeroy's paper embraced the different methods of dealing with narrowing of the meatus during suppurative otitis media, by the use of cotton and probe, flexible silver tubes, incisions, etc.

DR. A. MATHEWSON, of Brooklyn, N. Y., reported

**A CASE OF ABSCESS OF THE CEREBELLUM, FOLLOWING OTITIS MEDIA
MONTHS AFTER APPARENT CURE.**

The case was one of chronic suppurative inflammation of the middle ear, with mastoiditis, in a child of eleven years, apparently perfectly and permanently cured for months, when, after indiscretion in diet, vomiting occurred and other symptoms, which seemed at first due to gastric and hepatic disorders. After two weeks, during which there were no marked or certain symptoms of brain complication, the child died in convulsions, and an autopsy revealed abscess of the cerebellum.

There was pus between the dura and tegmen tympani, but the bone was not carious. The ear and mastoid seemed healthy.

The discussion of this paper was especially on the necessity of ophthalmoscopic examination in cases of suppurative otitis, and the value of optic neuritis for diagnosis and prognosis.

DR. C. S. MERRILL, of Albany, N. Y., reported

A CASE OF ACUTE MIDDLE EAR INFLAMMATION, WITH DEATH ON THE FOURTH DAY FROM EXTENSION OF THE DISEASE TO THE BRAIN.

Patient complained of a sense of fullness in the right ear and impaired hearing. The membrana tympani was somewhat congested, but otherwise normal. The hearing distance for the watch was in the right ear $2\frac{1}{2}$ inches, in the left ear 7 feet. Politzer's inflation was followed by improvement of hearing to 4 inches. Advised application of leech to tragus and mastoid. The following day the patient was entirely relieved; on the next day he returned to his work contrary to the advice of the physician and subsequently was seized with severe pains; was again seen by Dr. Merrill the following day. There was then severe meningitis, pulse 160, temperature $103\frac{1}{2}^{\circ}$ F., respiration 28; patient delirious most of the time. The membrana tympani was bulging and greatly inflamed. Free incision of the membrana tympani gave issue to a large quantity of pus. On inflation by means of the catheter the Eustachian tubes were found patent. Local inflammation subsided, but meningeal inflammation increased and coma supervened. Death occurred on the fourth day after appearance of the ear symptoms. The autopsy showed pus over the region of the petrous bone, extending from the tympanic cavity through two or three small openings in the tegmen tympani.

The propriety of inflation in cases of acute and subacute inflammation of the middle ear, and the probable efficacy of rigorous general treatment, were the most interesting points of discussion on this paper.

DR. READ J. MCKAY, of Wilmington, Del., read a paper on

AURAL POLYPUS, FACIAL PARALYSIS, MASTOIDITIS, AND CHRONIC MENINGITIS, WITH RECOVERY FROM THE TWO LATTER.

When first seen by Dr. McKay the patient had suffered eight years from otorrhœa from the left ear, the result of a blow on the ear. A large polypus was found, which was removed by Blake's snare, and the stump was touched with solut. argent. nitr., drachm. ii. Instillation of solut. zinc. sulph. acid. carbol. were continued for some time, but this treatment failed to entirely remove the granulations. The patient ceased his visits, but five months after was seen again, during the interval having been treated for "gastric fever" by his family physician. There was left facial paralysis, and continued pain in the left ear and left side of the head, relieved somewhat by applications of warm water and solut. argent. nitr., scr. ii. The patient again disappeared, but returned four weeks later. During this time he had been treated for "malarial neuralgia." Ophthalmoscopic examination showed well-marked optic neuritis left and congestion of optic disk right. Leeches were applied with great relief and minute doses of calomel given till slight ptialism appeared. Then a gradual improvement followed, pain and swelling disappeared, vision improved, and the optic neuritis subsided; facial paralysis and otorrhœa, however, persist and the granulation is not entirely removed.

DR. E. E. HOLT, of Portland, Me., presented a paper on

BOILER MAKER'S DEAFNESS AND HEARING IN A NOISE.

The opinion advanced by Dr. Holt upon, "Boiler maker's Deafness" and "Hearing in a Noise" was based upon the examination of forty men from the shops for making steam-boilers at Portland, Me., and of such other patients as made the claim that they could hear better in a noise, amounting in all to over one hundred cases that had been examined. The investigation showed that the deafness incident to boiler makers was due more to the effects of the occupation upon the conducting apparatus of the ear, than to the perceptive parts of the same organ, since they heard the tuning-fork, as a rule, as long or longer than the normal ear, even with the external auditory meatus closed. All men engaged in this occupation become more or less deaf,

the degree and length of time elapsing before this occurs depending largely upon the tendency of the middle ear to catarrhal inflammation, which was excited by constant movements of the ossicles, and which, affecting the delicate joints, thereby producing ankylosis, was the cause of the deafness. In these and in other persons who made the claim that they heard better in a noise, the apparent phenomenon was due to the more or less ankylosed condition of the ossicles, whereby more or less of the sounds given off in any noisy place were not received, constituting the deafness, and when the voice was raised, as it was invariably in such places, the sound produced by it was conducted by the sound transmitting apparatus with less confusion than by the normal ear, in which the ossicles must be in a to and fro movement, or else the innumerable noises would not be heard and there would not be confusion of sounds.

DR. S. THEOBALD, of Baltimore, Md., reported a case of

COMPLETE CLOSURE OF BOTH EXTERNAL AUDITORY CANALS FOLLOWING CHRONIC OTORRHOEA.

Both auditory canals ended in a cul-de-sac, 2 centimeters deep on the right side and 1.7 centimeters on the left. The auricles were normally developed, and the outer half of the auditory canals presented the normal appearance, but in place of reaching to the tympanic membrane, each canal ended abruptly a little beyond the extremity of the osseous meatus in a smooth, firm, concave floor, covered with thin integument, continuous with and similar to that lining the outer portion of the meatus, and presenting to the probe the unyielding resistance of a thick bony septum. The hearing was greatly impaired, but the patient was not profoundly deaf. This condition has persisted more than ten years with no apparent change. From another case, recently under observation, he believes this condition to be due to periosteal thickening.

The discussion of this paper was postponed to the afternoon session, and the Society then adjourned to 4 P. M.

Afternoon Session.—The second session was opened by the President at 4 P. M. After the ordinary business was transacted Dr. Theobald's paper was discussed and similar cases reported.

DR. H. KNAPP, of New York, N. Y., read a paper on

THE TREATMENT OF AURAL POLYPI.

The principal object of Dr. Knapp's paper was to vindicate the old method of treating polypi by evulsion. This he considers not attended with danger, provided it be not resorted to until the polypus has become pedunculated. Large polypi invariably contract at the base, and the thin pedicle can easily be separated. Hence their removal is easier and relapse less likely to occur. For surgical interference Dr. Knapp uses, in order of frequency, Hinton's forceps, Wilde's or Blake's snare, Politzer's ring-knife, and Wolf's sharp spoon. For the treatment of smaller polypi or roots of larger ones he employs alcohol and boracic acid, which not only diminishes the abundance and offensiveness of the discharge, but also causes the swollen mucous membrane to shrink more than any other treatment. Frequently the alcohol contracts the polypi, causing them to project and thus easily be removed.

The discussion of this paper related to the comparative efficacy of evulsion or removal by snare, and to the treatment of polypi by local applications, alcohol and boracic acid being preferred.

DR. A. C. BRANDEIS, of New York, N. Y., presented a paper entitled

EXHAUSTION VERSUS INFLATION.

He spoke of the disadvantages attending the use of the Valsalvian method, the catheter, and of Politzer's air-douche. In all of these it is impossible to graduate the degree of pressure employed and therefore there is an increased difficulty of hearing, and also more tinnitus and vertigo than before. By using compressed air he is able to regulate the force of the current of air employed, and thereby obviates some of the last effects. In many cases, however, these methods prove unavailing, and then he employs traction or exhaustion of air from the external meatus. This he does by means of a Siegle's speculum, which is attached to an exhausting syringe, which can exert any degree of traction desired. By carefully watching the excursions and appearance of the membrane and chain of bones, the operator is able to determine when further manipulation should cease.

DR. C. J. KIPP, of Newark, N. J., made a verbal communication

relative to the appearance of deafness in connection with synchysis scintillans of the vitreous.

The different papers were referred to the Committee on Publication.

The following were elected

OFFICERS FOR THE ENSUING YEAR.

President. — Dr. J. Orne Green, of Boston, Mass.

Vice-President. — Dr. J. S. Prout, of Brooklyn, N. Y.

Secretary and Treasurer. — Dr. J. J. B. Vermyne, of New Bedford, Mass.

The Society voted to meet next year the day before the annual meeting of the American Ophthalmological Society, and at the same place, and then adjourned.

Book Notices.

GESCHICHTE DES TAUBSTUMMEN BILDUNGSWESENS. (*History of the Instruction of Deaf-mutes.*) EDUARD WALTHER, 1882. BIELEFELD AND LEIPZIG. VELHAGEN & KLASING. 438 pp.

The work before us, treating especially of the development of the instruction of deaf-mutes in Germany, is from the pen of Eduard Walther, Director of the Wilhelm-Augusta Stift Institute for Deaf-mutes in the Province of Brandenburg. The author in the preface declares the object of his work to be: to increase the interest already felt in the instruction of deaf-mutes; to excite public sympathy; and especially to aid younger teachers who have not access to large libraries.

In the introduction he gives the following reasons why, until within a few centuries, little had been done for the instruction of deaf-mutes.

1. Deafness, of which dumbness is a natural consequence, is not a defect, which attracts immediate notice.

2. Deaf-mutism was always classified with idiocy; hence any effort at instructing was deemed useless.

3. The dogma then prevailing, that it was the divine will that some should be deaf-mutes, made opposition seem sacrilege.

4. Dumbness was considered a disease *sui generis*, and not the consequence of deafness; its treatment was mostly internal and by the use of specific remedies.

5. Since popular education dates only from the time of the Reformation, it is not astonishing that the instruction of deaf-mutes should have been even more neglected. The period of instruction of deaf-mutes begins with the sixteenth century, and, according to Hill, may be divided into three sub-periods:—

- (1.) Sporadic efforts at teaching. From the sixteenth to the end of the eighteenth century.

- (2.) Founding of institutes for deaf-mutes; the idea of colonization. From the end of the eighteenth century till 1828.

- (3.) Generalization and simplification of the instruction. From 1828 till the present time.

The first chapter of the work treats of the time prior to the sixteenth century, and bears the suggestive title: "Night." It was night for the poor sufferers, and science was also silent as to any knowledge in regard to their condition. It alludes

to the probable condition of deaf-mutes among the Israelites, according to certain texts in the Old Testament ; also among the Spartans and the Romans at the time of the republic. The account of the son of Cræsus, a deaf-mute, is given as related by Herodotus. This the author considers a myth, since the patient could certainly not have recovered suddenly his power of speech, even had his hearing been restored. Pliny is quoted as saying that Pedius, a deaf-mute, had been taught the art of painting. The author thinks it quite astonishing that among people where the pantomime had reached such a high degree of perfection, no efforts were made to instruct deaf-mutes by this method. Finally, he quotes the deaf-mutes spoken of in the New Testament, as having both hearing and speech restored by Jesus. With the simplicity of a strong and earnest Evangelical faith, which characterizes the entire work, he believes that to Jesus alone this power was given.

In the second chapter the author treats of the sporadic instruction of deaf-mutes. It appears that some efforts had been made at different times prior to our having any direct historical knowledge of it, for it is spoken of in the works of Rudolf Agricola (1400), and of Hieronymus Cardanus (1501-1576). The latter makes the statement that deaf-mutes were intelligent beings, highly capable of development, and could even be taught writing. But the first actual instruction began in Spain by Pedro de Ponce, a monk (died 1584). He has left no record, although some of the older authors make mention of his writings. Bonet published in 1620 a work on the nature of the sound of letters and the art of teaching mutes to speak. The sense of vision was employed, the pupils were taught the sound language, the objects were displayed, and the finger alphabet served as a medium between the written and the spoken words. From the fact that Bonet held an official position in the house from which one of De Ponce's deaf-mute pupils came, his work probably was founded on the system of De Ponce.

Wallis in England, and Amman in Holland, gave special attention to many points in the elementary instruction in speaking, and their writings became a basis for many of the treatises on instruction of deaf-mutes, written during this period. They endeavored not only to have their pupils speak the language mechanically, but clearly comprehend it, and in order to accomplish this, employed signs and gestures, pictures or objects; hence it was in some respects object-teaching. Some authors of this period attempted to instruct grammatically. Altogether, as the author remarks, it would not be difficult to construct out of these different writings a system which would very closely correspond to the system at present in vogue. The sign language, to which importance is still attached as a historical feature, was then used by all. Some, like Kerger, in Germany, even went so far as to attempt to base upon this sign language a universal language; others, like Arnoldi, only wanted to use that sign language which the deaf-mutes originated themselves. Most of the German instructors rejected the finger alphabet, with the exception of Lasius. There appears in general among these different teachers

a great earnestness of purpose, and a spirit of pure philanthropy. In many this was elicited by deaf-mutism in their immediate family or friends ; in others, who were priests or ministers of the gospel, in order to give the unfortunate sufferers the benefit of religious instruction. In this, as in every science during this period, there also appeared some whose motives were less pure, or whose methods less scientific. To the first belong Pereira, in France, who made a secret of his system, and offered it for sale ; to the latter Carrion, in Spain, who added to the instruction a medical treatment, a sort of specific arcanum, and Van Helmont, in Holland, who believed that deaf-mutes should be taught Hebrew, as he considered that to be the original language. The most eminent teachers of this period were De Ponce, Bonet, and Carrion, in Spain ; Bulwer, Wallis, and Holden, in England ; Van Helmont and Amman, in Holland ; Kerger, Raphel, Lasius, and Arnoldi, in Germany ; and in France, Pereira, Deschamps, and Ernaud. The latter's system probably comes nearest to the one presently followed in the German institutes for deaf-mutes.

In the third chapter the author treats of instruction of deaf-mutes in exclusive institutions. Thus far the instruction of deaf-mutes had been confined to a limited number, namely, those whose parents could afford the expense of this instruction, and those taught from pure philanthropy. These sporadic efforts at teaching did not, however, avail much to the deaf-mutes at large, except in the moral influence exerted, and in establishing a method for teaching. After schools for deaf-mutes were instituted the prospect of success dawned for them. As larger numbers were brought together, the interest in deaf-mutes became more general, and the method of teaching better regulated. The latter consideration, however, had this objection: with the limited number of schools, the principals of these schools were relied upon too much as authorities, and in this way the real progress was checked. This was especially seen in the system which was introduced in France, a system quite different from that which thus far had been the object in teaching deaf-mutes, and which influenced the course of instruction not only in France, but also in Germany and other countries. This system was introduced by the Abbot de l'Épée, and was made up of signs and gestures, and the finger alphabet developed into a distinct science, while the sound language was entirely left in the background. It will be seen at once that this was by no means a step forward, for the teachers of the former period all started with the idea that the sound language was the only one through which deaf-mutes could be placed on a level with *speaking* persons, and not an intricate system of signs and gestures. In Germany, however, the sound language was still retained ; hence, in this period two distinct schools appear: the French School, headed by De l'Épée, and the German School, represented by Samuel Heinicke.

The French School, represented by De l'Épée, Sicard, and Jamet, aimed especially at instruction by means of the sign language. It was considered that signs and gestures were to the deaf-mute what words were to speech, a language en-

tirely their own, and different text-books and dictionaries of sign language were written.

The German School may be subdivided into the Leipzig, Vienna, and Schleswig Schools. Of these three the first alone can be credited as belonging originally to the present German system. On April 14, 1778, the first school for deaf-mutes was founded in Leipzig, by Samuel Heinicke. Although his method was never well known, yet the general principle of his instruction was that of sound language versus sign language, and it is more than probable that he used the works of Amman and Raphel as guides. His course was first teaching in writing, and if the pupil had so far advanced that he could express himself intelligently on different subjects, then the sound language was taught. For assistance in the instruction in sound language he did not employ the sense of vision, as recommended by older teachers, but that of taste. The taste of vinegar, bitter extracts, water, sweetened water, or olive oil, each corresponded in the mind of the pupil to one of the vowels. His system was followed by his sons-in-law, Eschke, the founder of the Berlin School for deaf-mutes, and Reich, who succeeded him in the Leipzig School, and by Sense, an autodidact, whose system resembled that of Heinicke.

The Vienna School was in some respects a daughter of the French School, its first teacher being Stork, who had been taught by De l'Épée, and with him was associated May, another pupil of De l'Épée. They followed the system of teaching by sign language, although May greatly simplified this language. May was succeeded by Michael Venus, under whose teaching the system gradually approached the so-called German method. The school of Waitzen, in Hungary, an offspring of the Vienna School, flourished especially under Schwartze, whose system may be considered a further development of that of Venus, and the school of Liny was founded by Reitter, a pupil of May. At the school of Prague the Vienna method was followed until Mücke's time (1834). He claimed that the aim of teaching deaf-mutes was the awakening of their slumbering powers of thought, thereby making them morally responsible, association with other people, and in general enabling them to enjoy the rights and privileges of mankind. For this purpose he rejects the sign language, and adds that this object can be soonest attained by using the sound language as a foundation for the written language.

The Schleswig School, represented by Pfingsten and Henson, was in some respects a combination of the Leipzig and Vienna School. Like the latter it adopted the sound language not as the principal aim of instruction, but only as an accessory to the written language, and extensive use was made of signs and gestures. But, on the other hand, the pupils immediately on their entrance were taught the sound language, and though sign language was used, it was not to the extent to which it was carried in the French or even the Vienna School.

Whatever might have been the system of teaching in these different schools, the teachers were unanimous in the opinion that the interest of the pupils required that they must be taught in exclusive schools, where they should live together.

This idea was carried so far that the colonization of deaf-mutes, with teachers from among their own number, was seriously considered.

The fourth chapter describes the process of generalization of the instruction.

The results obtained in the instruction of deaf-mutes were so encouraging that the public interest was generally awakened throughout Europe, especially in Germany, where a number of government schools were established. These schools, however, reached comparatively few of the large number of deaf-mutes, and the expense of building and sustaining still other schools became in some cases very burdensome. It was natural, therefore, that some means should be devised to remedy this condition of things; so it was thought that clergymen and school teachers, from coming in contact with all classes, might be the proper teachers. Consequently, in many countries, especially in Germany, instructors were prepared at the theological schools (*seminaria*), or were sent to a school for deaf-mutes, in order to familiarize themselves with the system of teaching, so as to enable them to perform that duty in connection with their ordinary school work. This system of generalization was largely advocated by Alle, Daniel, Graser, Czech, and Wich. It prevailed from 1829 to 1874. The change thus made caused a healthy reaction, and great enthusiasm prevailed in the teaching and development of the different methods, as the works of the above named teachers will testify. It was less expensive than the separate schools, and a large number of persons, professors and teachers at the seminaries, theologians, and teachers of the common schools, were interested in the instruction of deaf-mutes, and became its advocates. There was no longer a lack of teachers; on the contrary, out of many the best could be selected. The deaf-mutes were no longer isolated, but associated with other children. This period of generalization continued for nearly half a century, and tended greatly to the further development of the German method, — the method which now is universally acknowledged the best, and one which earnest men continually are striving to perfect.

It soon became apparent, however, that the success of this system was likely to be threatened by the coeducation of deaf-mutes and other children to the disadvantage of the latter. The idea that deaf-mutes should be taught in schools by themselves soon became a popular one. Consequently they were again taught at separate schools, but without being debarred from living and daily intercourse with other children. The latter plan was also much less expensive.

The fifth chapter describes the methodical development of the instruction.

One of the best results from the period of generalization was the gradual elimination of everything that was superfluous from the instruction in sound language. We now find instruction in the sound language superseding that in the sign language and the finger alphabet. Thus the principles of the French method and the influence of the Vienna School were entirely abolished, while the system of Amman-Heinecke survived. The authors and teachers who effected this result worked in two different ways. The one method was represented by Jäger, Sae-

gert, Jarisch, Aichinger, and Lampl. Still under the influence of the French and Vienna system they taught the sound language from the grammar. They adhered to the old method of teaching, that is, they first taught different classes of words in regular order, as nouns, verbs, etc., then began to construct sentences, according to the rules of the grammar. The entire plan of instruction was altogether too systematical, not at all in harmony with the natural development of speech in the child. For this reason no real progress was made, except the slow and gradual emancipation from the French School. It must however be observed that in the common schools the same system prevailed. Becker in 1833 declared that in order to be successful, instruction should proceed from the language of the child itself as a starting-point. Not until then did the public schools approach a natural form of teaching, and the same can be said of the instruction of deaf-mutes.

The other method was represented especially by Hill, Arnold, Kruse, Priester, Schöttle, and Cüppers, Rössler and Vatter. Although employing different methods, their object was the same, viz., a more direct object teaching for a basis of the instruction; sound language and a minimum or entire abolishing of signs; grammatical forms to be acquired from usage and not to be made the principal method, — a more natural form of teaching, corresponding with the newer methods of instruction in the public schools. It is evident that, in forming and developing the ideas of deaf-mutes, it is not possible to follow exactly the same plan as in common schools, since they must not only be taught to think, but to speak also. The first six teachers separated the object teaching from that of the language, the two latter combined it, but the result desired was the same in all. To their efforts as teachers and authors we are greatly indebted.

The book ends with an enumeration of the institutes for deaf-mutes in Germany, ninety-five in number, giving also the manner of their support. Besides these the German language is taught in twenty-four schools, outside of Germany.

A few notes are given relative to some of the most active teachers now living, Weissweiler, Kilian, Matthias, Stahm, Gude, etc., and the regular course of instruction now followed in the German schools is finally described. The second paragraph of this course reads as follows: "To obtain this end" (to make deaf-mutes morally responsible, fully capable of enjoying civil rights), "deaf-mutes must be taught sound language, in order that they may understand what is told them orally or graphically and express their thoughts in speech and writing; also to give them knowledge of all such branches as are taught in the common school — except singing." Eight years is the time required for a full course of instruction, and small classes (not larger than ten) are preferred.

The subject-matter of this work does not belong directly to the domain of otology, but to that of education. It cannot fail, however, to interest otologists, since the statistics of ear infirmaries and hospitals and the records of private practice yearly show a number of cases of deaf-mutism. Even if the physician cannot restore hearing, and thereby make speech possible, he can indicate to the parents

the way in which lies the hope for moral and mental development of their unfortunate offspring. The different systems, as followed by each teacher, are mentioned in detail, though only generalized in this abstract, and, as the author states in his preface, many repetitions necessarily occur in the enumeration of their methods. But the reading of the book is made interesting by the biographical sketches which serve as an introduction to the system of each teacher, and which cannot but excite admiration for the patient workers in this branch of education.

J. J. B. V.

Reviews.

ON THE FUNCTION OF THE TWO EARS IN THE PERCEPTION OF SPACE. SILVANUS P. THOMPSON. *Philosophical Magazine*, June, 1882.

This paper considers the various theories that have been proposed for the localization of a source of sound by the ears alone. Besides the binaural parallax which various researches have shown to exist, there are also imperfect monaural perceptions of space. In all comparisons with optical phenomena the following facts must be remembered: (1.) The ear has no lens, and nothing equivalent to it. (2.) The structure of the ear is such that its different parts are not sensitive to different directions in the movement of acoustic waves, but only to their difference in frequency. (3.) The ears cannot be turned towards different directions as the eyes can be, independently of the movements of the head, at least in man. Of the four physical characteristics by which sounds are discriminated from each other, viz., intensity, pitch, phase, quality, the third is one for which the single ear possesses no direct means of perception. There is, however, a perception of phase in binaural audition, as has been shown independently by S. P. Thompson, A. G. Bell, and Sir William Thomson.

The theory of Steinhauser is based on a geometrical estimation of the relative intensity with which a sound will reach the two ears when starting from any given point in space. Calling β the angle between the plane of the ear and the line of sight, and α the angle which the line of sight makes with the direction of the sound; and letting i_1 and i_2 represent the relative intensity with which the sound is heard in the two ears; then $\tan. \alpha : \tan. \beta :: i_1 - i_2 : i_1 + i_2$.

The operation of finding the direction of a sound — say, a lark singing high up in the air, is, therefore, according to Steinhauser, as follows: First, the head is rotated on its axis horizontally until the sound is heard with equal loudness in both ears; then the head is moved up and down until a maximum of loudness is discovered, when the lark will be found in the line of sight. This theory takes no account of differences of phase, pitch, or quality, but of intensity only; and it fails to account for the fact that we have, without moving the head at all, a very fair perception of the direction of sounds. A similar theory has been implicitly adopted by A. G. Bell, whose paper was published in this JOURNAL for July, 1880. Bell found that the ear can determine the direction of a sound most accurately when this direction approximates to the axial line of the ears.

S. P. Thompson was led by certain phenomena to suppose that the relation of phase of the sounds entering the two ears had an important influence; so that when the gaze of the observer is directed in the precise direction, not only would the intensities be equal, but the phase would be identical. The *topophone* of A. M. Mayer is based upon the same principles.

Mach supposes the perception of direction to arise from the operation of the pinnae of the ears as resonators for the higher partials of compound tones. This action will be more or less effective according to the position of the pinnae with reference to the direction of the sound-waves, so that by reënfencing with unequal intensity in different directions, the quality of the sound would be different as heard by the two ears except when the source of sound lay in the median plane of the head. A variation in quality should also occur for sounds in the median plane, according as they were above, below, or in the line of sight, on account of the dissymmetry of the upper and lower parts of the pinna. Somewhat similar is the view of Rayleigh, who considers that on account of the diffraction of the sound-waves entering the ear, the partial tones of different pitch will arrive at the side of the head opposite to that nearest the source of sound with very different intensities. Rayleigh's theory, therefore, agrees with that of Mach in attributing the acoustic perception of direction to differences of quality between the two ears, the brain drawing, from the slight differences of the tones received in the two ears, an unconscious judgment based on empirical observation, while differing from the theory of Mach in not making any assumption as to the function of the pinnae as resonators.

The theory of Küpper that sound-waves proceeding in different directions affect different parts of the tympanum, and so give rise to different sensations, is untenable, both on account of the physical structure of the ear and because experiment shows that nothing is more difficult than to tell the direction of sounds whose source is in the median plane of the head.

The author proceeds to a comparison of these various theories in their ability to explain known facts, and concludes that "if, in binaural hearing, the direction of the sound were to be estimated only by the process of moving the head until the line of sight coincided with that of the sound, then Steinhauser's theory accounts best for the facts. If, however, the direction be estimated while the head is held immovable, then the resolution theories are certainly the more satisfactory." Steinhauser's theory also fails to explain why there is any perception of the direction of sound in monaural audition. Thompson propounds the following theory which he believes to cover all the facts hitherto observed. "Judgments as to the direction of sounds are based in general upon the sensations of different intensity in the two ears; but the perceived difference of intensity upon which a judgment is based is not usually the difference in intensity of the lowest or fundamental tone of the compound sound (or 'clang'), but upon the difference in intensity of the individual tone or tones of the clang for which the intensity-difference has the greatest effective result on the quality of the sound."

The acoustical perception of direction is not intuitive but associative, just as the optical perception of direction is. The ear has learned to associate certain differences in the quality of sounds with different directions, and on these associated impressions judgments as to direction are based. It is doubtful if a simple tone heard in one ear could suggest any direction at all.

Our judgments of the distance of familiar sounds are based chiefly upon their relative loudness. It may be possible in the case of short distances to judge of distance by the difference in the direction of the sound as perceived in the two ears. The quality of a compound sound also differs slightly with distance, independently of direction. It is extremely doubtful, however, whether any such judgments are actually made.

The author calls attention to the desirability of observations upon persons of abnormal hearing, and mentions the case of a gentleman entirely deaf in one ear in whom all acoustic perception of direction was wanting. Experiments are also needed to determine the functions of the pinnae and their convolutions, and makes some brief suggestions regarding this point.

C. R. C.

A BEAD ENCYSTED IN THE MIDDLE EAR. (*Une Perle enkystée dans l'Oreille moyenne.*) Dr. E. J. MOURE. *Revue Mensuelle de Laryngologie, d'Otologie, etc.*, No. 6, 1882.

A coachman, twenty-nine years old, applied to Dr. Moure for relief from deafness. In the left ear the membrana tympana was found to have been destroyed in its posterior three quarters. The remnants of the malleus were seen *in situ*, and on a level with the postero-inferior wall of the tympanum, forming a slight prominence outward from the drum, was seen a kind of rounded eminence, smooth on its surface and about as large as a small pea. Its color was pale pink, and led to the impression that it might be a simple exostosis on the lower part of inferior wall of the tympanum. "After having cleaned the ear," says Dr. Moure, "I introduced my probe to the surface of the tumor, and *gently eroded* the mucous membrane covering it without giving the patient the least pain. Upon repeating this operation I observed that my probe passed into a rounded, shallow depression, also covered by mucous membrane. By exerting some force I was able to introduce my probe about a millimeter into this opening without meeting any resistance from bony tissue, and without causing pain to the patient. A drop of blood followed this abrasion, and all further explorations were stopped." In the course of a week this same prominence was seen to be still perfectly smooth and clean and resembled a bead, the hole of which corresponded with the axis of the auditory canal. The patient knew nothing about having put any bead in his ear. Nevertheless it appeared to Dr. Moure that without doubt the bead was in this man's ear, and that by introducing a probe into the hole the slightly oval character of it could be made out.

"Although convinced, however, of the presence of this foreign body, which is

yet in the ear, since there was no trace of inflammation, as the bead was encysted beneath the mucous membrane, it was not deemed advisable to propose extraction, because there was no probability of improving the patient's hearing, and I was unwilling to expose him uselessly to the risks of inflammation which would have been inevitable after such an operation."

The question naturally suggested by this paper is — could the observer in this instance have mistaken the promontory and the niche of the round window for a bead and its hole?

THE PROGNOSIS AND TREATMENT OF OTORRHOEA. (*Considerations sur le Pronostic et le Traitement de l'Otorrhée.*) BY DR. SHIFFERS, Assistant in the University of Liège. LIEGE, 1880. Review in the *Revue Mensuelle de Laryngologie, d'Otologie*, etc. No. 6, 1882.

This monograph, though not a new publication, contains some truths which should be placed before the eyes of physicians from time to time. That singular error, that the suppression of an otorrhœa is attended with danger, viz., that by stopping it there may ensue consecutive cerebral diseases, is still believed and acted upon by a number of physicians. The author of this brochure endeavors to show by irrefutable facts, based on anatomical and clinical observation, that physicians holding such views are guilty of either culpable ignorance or indifference, and to them he addresses himself.

The author then reports a case observed by him in which a chronic purulent catarrh of two years duration had been treated by nothing but warm water syringing. This had induced the growth of granulations and polypi in the ear, which interfered with examination of the fundus, and also suppuration in the mastoid cells. A deep incision behind the ear was followed by an escape of pus from the wound and recovery ensued.

The prognosis in chronic otorrhœa necessarily varies with the nature of the disease of which it is only a symptom. In any case this disease demands attention, because of the intimate relation between the middle ear and organs of capital importance, such as the brain, the carotids, and the jugulars, to which the inflammation may spread. In addition to these local lesions, others of grave import may ensue, since chronic purulent catarrh of the middle ear may assume the nature of an osseous abscess, and become the determining cause of a pulmonary or a general tuberculosis. Von Troeltsch is quoted as having said that those subjects afflicted with chronic otorrhœa never attain old age, and several English insurance companies decline to insure those with this disease.

In treating these cases, reliance must not be placed entirely on local or on general treatment. The latter should be a combination of medical and hygienic treatment. To bitter tonics and ferruginous preparations there should be joined an extended hygienic and hydropathic treatment, which latter in some instances has excellent effects. The local treatment set forth in this brochure consists chiefly in

the use of the syringe and instillations, the latter being those best known — no new forms being suggested. The insufflation of powders is limited to those cases in which the discharge is slight, and the opening in the membrana tympani large.

TONSIL-DEAFNESS. (*Étude sur la Surdit  Amygdalienne.*) PAR DR. NOQUET. Reviewed in *Revue Mensuelle de Laryngologie d'Otologie, etc.*, No. 6, 1882.

An increase in size in the tonsils is very often attended with deafness. This increased development may be due to the presence of tumors of different kinds: as cysts, fibromata, gummata, syphilitic tubercula, lymphadenomata, lympho-sarcomata, and cancers. But these tumors are rare, and the enlargement of the tonsils is usually due to simple hypertrophy, and it is during the course of this affection that disturbances in the hearing are observed. He draws attention to the fact that naso-pharyngeal catarrh and chronic coryza augmented by the narrowness of the nasal fossæ, are often met in subjects affected with enlarged tonsils, and as a rule he asserts that generally when the tonsils are greatly enlarged the hearing is somewhat impaired. If hypertrophy of the tonsils has no effect on the hearing, it is due to the fact that the enlargement occurs so low down that the velum palati is not forced upward, and also that there is no simultaneous naso-pharyngeal catarrh. How hypertrophied tonsils affect the hearing is not explained in the same way by all authors. Noquet's conclusions are as follows: —

1. Hypertrophied tonsils favor the production of naso-pharyngeal catarrh, and not only excite it, but keep it up. This catarrh may obstruct the mouth of the Eustachian tube by concretions of mucus, by granulations, by the swelling of the mucous cushion, and by inducing an incomplete paralysis of the velum palati. It may also be propagated to the mucous membrane of the tube, which becomes thickened, reach the tympanic cavity, and then set up a simple chronic catarrh, preceded by acute or subacute attacks, or a chronic purulent otitis media, with all its consequences.

2. Tonsils very much enlarged near their upper part or on their antero posterior surface, interfere with the fixation of the velum palati. Consequently the external peristaphiline muscles can no longer open the tubes, and the air in the tympana becomes rarefied. This, then, becomes a cause of deafness, aside from the naso-pharyngeal catarrh, as soon as the catarrh has once been set up. This also occurs when the tonsils, affected with any form of pathological development, have pushed up the palate and separated the pillars of the pharynx, or when the neoplasm itself may have grown over the tubal orifice. These conclusions explain why in some cases of hypertrophy of the tonsils, deafness exists only on one side.

The prognosis varies according to the nature of the case. In simple hypertrophy, without naso-pharyngeal catarrh, excision of the tonsils is followed by cure. In case the tube is obstructed, improvement will be rapid if the disease is recent, longer if the affection is chronic. If the catarrh shall have reached the tympanic cavity, and have set up there either a simple or a purulent otitis media, the chron-

icity of the lesions, the labyrinthine complications, a large perforation in the membrana tympani, and the loss of the ossicles, will complicate the prognosis, which, furthermore, is subordinate to the neoplasm which has invaded the tonsil. Regarding the treatment it may be said that when the hypertrophy is slight, and when the deafness is not great, the thermal treatment of Lawbron, whatever that may be, may be tried with good effect. But Noquet believes that when the organ of hearing is much involved, that excision of the tonsils should be effected as soon as possible. But M. Noquet seems to have lost sight of the fact, so well known to aurists, that enlarged tonsils are so constantly seen without consequent aural affections, while ear diseases and deafness are constantly seen without enlargement in the tonsils. In fact, in an experience based upon the observation of over three thousand individuals affected with ear-disease, not one case has been seen by us in which it was even probable that the tonsils needed excision. Local treatment, and, above all, proper hygiene and the use of internal remedies, have always reduced the enlarged tonsil to a proper size. Excision of the tonsil has been relegated to the limbo of unnecessary operations by the wider studies of the aurist, who has had the best chance of seeing a greater number of cases in which the enlarged tonsil would do harm, if it could, to the hearing. M. Noquet, naïvely, adds, that together with the operation of excision, which, we admit, is an impressive one to the patient and his family, "it will be indispensable to administer iodide of iron, cod-liver oil, cinchona wine (*vin de quinquina*), and to order salt and sulphur baths, and also, in some cases, to give mineral waters, and at the same time to institute a most careful hygiene." He might have added that such treatment would do away with the necessity of the surgical operation in almost all cases. The few exceptions would be in the case of tumors or malignant growths in the tonsil.

CURABLE CONGENITAL OBSTRUCTION OF BOTH EUSTACHIAN TUBES. (*Obstruction Congénitale Curable des Deux Trompes d'Eustache.*) *Revue Mensuelle de Laryngologie d'Otologie, etc.*, No. 7, 1882.

Dr. Thaulow reports the case of a boy, thirteen years old, regarded as a congenital deaf person, who consulted him for relief. The patient had never had scarlatina, nor otorrhœa; his facial expression was that of a mute. Examination revealed narrow auditory canals and thickened membranæ tympani. After catheterization, accomplished with considerable force, the patient heard better, and after a treatment of six weeks, consisting in the air-douche and inflations with chlorohydrate of ammonia, the boy could distinctly hear the voice at a distance of a metre, and his face appeared much more intelligent. Dr. Thaulow concludes that all children placed in institutions for deaf-mutes should be most carefully examined.

NOUVEL AUDIOMETER. DR. LADREIT DE LACHARRIÈRE. *Annales des Maladies de l'Oreille, etc.*, Juillet, 1882.

Observations of the acuity of hearing have no scientific value, so far as communicating their result to others, unless the observer can express himself with exactitude. Suppose, for example, a patient has lost the half or three quarters of his hearing power: to simply affirm this is of no value unless we possess an unchanging and uniform method of measuring this sensibility, and of establishing, so to speak, a *unit of hearing*.

This unit must be the minimum of sound perceptible by the human ear, and by multiplying this we shall possess sounds of greater intensity; and when at last we can say that an individual hears no more than sounds of the value of ten, twenty, or one hundred units, we shall be using a language of uniform mathematical exactness.

The instrument devised by Lacharrière is said to realize all these conditions. It is made by Gaiffe; the unit adopted is the unit of electric resistance universally used, to which the name of Ohm is given, and the passage of the current through the rheostat permits only those sounds to reach the telephone the force of which is proportioned to the units of resistance.

The writer then reviews the various audiometers of others: viz., those of Conta, Politzer, Blake, and Hughes; but, in his opinion, all have the great fault of giving only one sound.

The instruments daily in use with which to measure the hearing are the watch and the tuning-fork. But they are defective, because they give always the same sound on the same note, and also because the minimum distance at which they are heard is always difficult to determine. The writer claims to have solved this difficulty in the case of the watch by the employment of the microphone, which permits of the augmentation of intensity of a feeble sound by multiplying the magnetic elements. The tuning-fork, however, gives a uniform sound, and one always proportionate to the force setting it in vibration. This uniform force the author claims to find in the action of induction coils maintaining the tuning-fork in vibration as long as the examination lasts.

His audiometer is composed as follows:—

1. A microphone for the testing of the power to hear noises, to be set in action by two small batteries of chloride of silver.
2. A tuning-fork to be set in vibration by a battery of four cells of manganese.
3. A telephone for transmitting the noises and sounds to the ear.
4. A rheostat for determining the number of ohms, or electric units, introduced into the circuit.
5. The principal induction coil is that of Boudet, of Paris.

With one ohm the observer will find the lowest sound, while with 20,000 he will be in possession of the loudest.

The generator of the noise-test is a watch placed on the shelf of the micro-

phone, and with the aid of the rheostat the observation can be made, of how much resistance is necessary to render the tickings of the watch audible by the telephone in the good ear, which is set down to be ten ohms.

The perception of tones is given by the tuning-fork. When this is set in vibration with two elements of the pile, a sound is made which becomes louder as one element after another is added. Lacharrière has determined that in order that an ear of moderate power shall hear the sound by telephone, with only two elements, the resistance of ten ohms is required. Starting with this, it is possible to determine the acuity of hearing by noting whether two, three, or four elements of the pile are in use. The writer thinks that by the employment of ohms (the universally-adopted unit of resistance) in his audiometer, it can be used by all physicians as an exact means of communication of the state of the hearing in their patients.

DES AUDIOMETRES. DR. J. B. *Revue Mensuelle de Laryngologie, d'Otologie, et de Rhinologie*, Août, 1882.

The writer, after reviewing the audiometers of Hughes, Ward Richardson, Bichat of Nancy, Boudet, and of Lacharrière, alludes to one he has employed in which he dispenses with the microphone entirely, because they do not act with precision. Nor does he employ two kinds of elements, as in the instrument of Lacharrière, but he uses the battery of Callaud-Trouvé, which also supplies the secondary battery of Planté and the polyscope of Trouvé.

ÉTUDE SUR L'HÉMATOME DE L'OREILLE. PAR DR. ROCKEEL. Published by Henry Rêy, 14 Rue Mons. le Prince, Paris. Review in *Revue Mensuelle de Laryngologie, etc.*, August, 1882.

The author has lately observed four cases of othæmatoma, and after reviewing the history of the literature on this subject and observing his own patients he comes to the following conclusions:—

1. Hæmatoma of the ear is not a disease peculiar to the insane.
2. It may be the result of direct traumatic violence, but in the great majority of cases it is preceded by an inflammatory degeneration or hypertrophy of the fibro-cartilage.
3. These anatomical alterations are the predisposing cause: every congestion of the ear becomes the exciting cause.
4. The extravasation of blood occurs between the perichondrium and the fibro-cartilage. Sometimes it occurs in the substance of the latter.
5. In the insane, othæmatoma is neither a sign of cachexia nor of incurability.
6. It is a benignant affection, but one which has the inconvenience of often leaving behind it greater or less deformities in the auricle.
7. It has value in a medico-legal sense.
8. The disease will heal spontaneously; but in such cases the deformity seems

to be greater. By incising the sac, time is gained, and the result is better in the end.

OSTEOSARCOMA OF THE AUDITORY APPARATUS. (*Osteosarcoma del aparato auditivo.*) D. LOUIS SUÑÉ Y MOLIST. *Gaceta Médica Catalana*, 15 May, 1882. II., No. 9.

In view of the few communications thus far reported on neoplasms of the temporal bone, especially on osteosarcoma, the author reports the following interesting case, which has come under his own observation.

Patient, male, sixty years old, is large and robust, somewhat rheumatic. The disease first developed in 1870, with symptoms of slight mastoid periostitis; this, with the exception of a hard swelling, was overcome without any treatment. According to the statement of the patient this consecutive hyperostosis was indolent. One year later a new growth appeared from the bony tumor, extending backward to the occipital bone, forward to the bony part of the meatus auditorius externus, involving also a portion of the squama of the temporal bone. The treatment consisted in local resolvent and caustic applications, without favorable result, and all treatment was finally abandoned. For several years the growth of the tumor was very slow, the skin becoming red and adherent to the underlying neoplasm. In 1880, lancinating pains occurred in the deeper part of the mastoid region — not continuous; slight hyperæsthesia on pressure; no ulceration or otorrhœa.

Examined first, February 4, 1881. The hard osseous tumor extended from the zygomatic apophysis through the osseous meatus, the mastoid process, and the left half of the occipital bone. On pressure two distinct sensations were notable: 1. The resistance of the skin, which was adherent to the subjacent bone; 2. Its firmness, not absolute, as is felt, for instance, when pressing the frontal bone through the skin; rather more elastic, giving to the pressing finger a peculiar sensation, as if on the surface of the bone there were a tissue less hard, but intimately connected with the bone. The form of the neoplasm was hemispherical, and in the regia mastoidea, where it was largest, measured five centimeters radius. The osseous part of the meatus was greatly swollen, so that the tympanum could not be observed in the usual way. Probing the meatus was followed by slight hemorrhage, and a small laminaria tent applied and allowed to remain for twenty-four hours did not produce any dilatation.

Acoustic symptoms. Complete deafness of the affected ear. Neither voice, watch, nor tuning-fork could be distinguished. The entire absence of a perception of vibrations of the tuning-fork justified an unfavorable prognosis, showing invasion of the deeper parts of the temporal bone and probable danger to the brain. No tinnitus.

The lancinating pain continued, and at times so severe as to interfere with sleep. This was for several days alleviated by instillation of eight drops of the following solution: Aqua lauroceras, 10; aconitine, 0.1; tr. belladonn. 5, every

three hours. The suffering was increased by the extending of the growth to the glenoid fossa, thereby rendering the movement of the maxilla very painful, and making it impossible to open the mouth more than one centimeter between the teeth.

Two months later, the surface of the tumor was darker red, and a well-defined plexus of vessels formed; the skin was more distended, so that suppuration or spontaneous opening with consecutive ulceration was apprehended.

June, 1881, vertigo appeared, lack of equilibrium, with tendency to fall, indicating affection of the cerebellum. There were distinct symptoms of compression, with consequent irritation of the cerebellum by the enlargement in the temporo-occipital region.

During July, vertigo and deep-seated pain, insomnia, and headache continued. August, vertigo and lack of equilibrium were very marked and walking impossible, except when supported, although no paralysis existed. September, the seriousness of these symptoms was greatly increased by anæmia from the small amount of food taken. Towards the end of October the tumor looked more erysipelatous, but no ulceration appeared. Daily vertigo, headache of left side, and lancinating pains deep in the ear became more frequent. At last coma, eophthalgo, conjunctival congestion, convulsions, inert pupils, sinking pulse; death three days after appearance of first comatose symptoms. No autopsy. The tumor might have been mistaken for simple osteoma or a deep-seated mastoid abscess. In the former case it would have been indolent and the skin normal; in the latter the tumefaction would not have spread over the occipital region, nor death occur with symptoms of compression and irritation of the cerebellum?

The author does not believe that surgical interference (removal by hammer and chisel) was justified in this case, on account of the possible danger of opening the sinus venosus or wounding the cerebrum or the cerebellum. J. J. B. V.

Bibliographical Index.

BOOKS.

CORNWELL, H. G.

The First Quarterly Report of the Eye and Ear Dispensary of Starling Medical College. Cincinnati, 1882.

DE ROSSI, E.

X anno d'Insegnamento, della Otojatria. Cenni Statistico-clinico per l'Anno Scolastico 1880-81. Roma, 1881. 8vo.

DU MONCEL.

Le Telephone. 4th edition. Paris, 1882. 12mo, pp. 390.

Le Microphone, le Radiophone, et le Pharographe. Paris, 1882. 12mo, pp. 300.

EVERETT, J. W.

Vibratory Motion and Sound. London, 1882. 8vo, pp. 135.

HOUDIN, A.

Rapport de Statistique, présenté au Congrès de Bordeaux pour l'Amélioration du Sort des Sourds-muets. Bordeaux, 1882. 8vo.

JONES, H. McN.

Treatise on Aural Surgery. 2d edition. Philadelphia, 1882. 12mo.

KIRCHNER, W.

Ueber die Einwirkung des Nervus Trigemini auf das Gehörorgan. Leipzig, 1882.

KOENIG, R.

Quelques Experiences d'Acoustique. Paris, 1882. 8vo, pp. 243.

LABORDE, J. V.

Essai de Détermination Expérimentale et Morphologie du Rôle Fonctionnel des Canaux Semi-circulaires. Paris, 1882. 8vo. (Reprinted from Bull. Soc. d'Anthrop., 1881, 3 s. IV., 797, 819; also in Tribune Med., Paris, July 9, 1882.)

LADREIT DE LACHARRIÈRE.

Des Maladies de l'Oreille. Extr. du Dict. Encyclop. des Sc. Med. Paris, 1882.

LONGHI, G.

Igiene dell' Orecchio. Milan.

NAKACHIAN (HAMPARTZOU).

De la Maladie de Ménière considérée principalement au Point de Vue de son Traitement (Sulfate de Quinine et Salicylate de Soude). Paris, 1882. 4to, pp. 40.

SCHMELCK, C.

Nogle Bemærkinger om Oeret og dets Plege, etc. Christiania, 1881.

TREILLET.

Du Cancer du Pavillon de l'Oreille. Thesis. Paris, March 17, 1882.

TROELTSCH, A. VON

Diseases of the Ear in Children. Trans. by J. Orne Green. New York, 1882. (Rev. Ann. des. Mal. de l'Oreille, du Larynx, etc. May, 1882.)

URBANTSCHITSCH, V.

Traite des Maladies de l'Oreille. Traduite et annotée par le Dr. R. Calmettes. Paris, 1881. 8vo, pp. 482, 8 pl.

WILLIAMS, J.

Taubheit ist heilbar! Hilfe für Ohrenleidende jeder Art. 9 Auf. Berlin, 1882. 8vo.

JOURNALS.**ABBOTT, G.**

New Aural Forceps. Lancet, Lond., Aug. 26, 1882.

ALTHAUS, J.

Hyperästhesie des centrum Auditorium. Centralbl. für Nervenheilk., No. 8, 1882; Monatsschr. für Ohrenh. Berlin, May, 1882.

ANONYMOUS.

Tone Blindness. Christian Register, Boston, June 29, 1882.

Acuter Mittelohrkatarrh. Aerzt. Ber. d. k. k. Allg. Krankenh. zu Wien. (1880), 1881, 304.

Ohrensausen; Epileptiforme anfälle. Aerzt. Int.-Bl., München, 1882, XXIX., 199.

Report of the Eye and Ear Department of St. Mary's Hospital. Detroit Clinic, July 26, 1882.

Deaf-mutism. M. Press and Circ., June 14, 1882.

Cerebro-spinal Meningitis as a Cause of Deafness. Am. Ann. of Deaf and Dumb, July, 1882.

ARNOLD, J. W.

Some Considerations on Aural Growths, with Two Cases of Polyp of the Middle Ear. Maryland M. J., Baltimore, Sept. 1, 1882.

AYRES, S. C.

Exostosen des Äusseren Gehörganges. [Trans. by H. Steinbrügge.] Ztschr. für Ohrenh., Wiesb., 1882, XI., 95.

BARATOUX, J.

De l'Insufflation de l'Air et des Vapeurs dans l'Oreille Moyenne et du Cathe-

terisme de la Trompe d'Eustache. *Rev. Mens. de Laryngol., d'Otol., etc.*, Paris, August, Sept., 1882.

Des Audiometres. *Rev. Mens. de Laryngol., d'Otol., etc.*, Paris, August, 1882.

BARBIER.

De la Surdit . *Cour. de Med.*, July 22, 1882.

BARR, T.

The Treatment of Certain Intractable Forms of Purulent Discharge from the Ear. *Glasgow M. J.*, 1882, XVII., 321.

BAUDRIMONT.

De la Fracture de la Paroi Ant rieure du Conduit Auditif et de la Luxation en arri re du Maxillaire inf rieur par P n tration des Condyles dans l'Oreille. *Jour. de Med. de Bordeaux*, July 16 and 22, 1882.

BELL, A. G.

Pronunciation of Deaf-mutes who have been taught to Speak. *Nature*, March 16, 1882.

BELL, A. M.

Sounds and their Relations. (Review) *Nature*, March 30, 1882.

BERNHARDT.

Casuistischer Beitrag zur Lehre von der Worttaubheit oder der sensorischen Aphasie. *Centralbl. f. Nervenheilk.*, No. 11, 1882.

BERTHELOT ET VIEILLE.

Sur la Vitesse de Propagation des Phenom nes Explosifs dans les Gaz. *Comptes Rendus*, XCIV., 13, March 27, 1882.

BERTHOLET.

Sur l'Onde Explosive. *Comptes Rendus*, XCIV., 4, January 23, 1882.

BEZOND.

Fourth Report of his Private Eye and Ear Infirmary in Munich. *Baier.  rztll., Intelligenzbl.*, 26, 1881.

BONNAFONT.

Note concernant les Phenomenes Nerveux qui peuvent  tre produits par la Pression de la Membrane du Tympan. *Comptes Rendus*, XCIV., 9, February 27, 1882.

BRANDEIS.

Deux Cas de Bourdonnement d'Oreilles Occasionn s par des Troubles Apport es   la Circulation du Sang les Vaisseaux Cervicaux. *Arch. Otol.*, N. Y., June, 1882.

Otite, Moyenne Catarrhale, sans Objectif (Construction Spasmodique des Muscles Tubaires) d'Origine Nerveux, Hysterie. *Arch. Otol.*, N. Y., June, 1882.

BRESINA.

Ueber die Schwingungen der Luft in der chemise Harmonika. *Carl. Repertorium*, 1882, 18, 1.

BRUNNER, G.

A Case of Complete Unilateral Deafness after Mumps. (Trans. by W. C. Ayres.) *Arch. Otol.*, N. Y., June, 1882; *Ztschr. f. Ohrenh.*, XI., 3.

BURCHARDT-MERIAN, A.

Supplement to Professor Moos and Dr. Steinbrügge's Case of Hyperostosis and Exostosis, Ankylosis of the Head of the Hammer, Bony Closure of the Round Window, Colloid Degeneration of the Acoustic Nerve in the Temporal Bone of an Eighty-year-old Maniac. (Trans. by W. C. Ayres.) *Arch. Otol.*, N. Y., June, 1882; *Ztschr. f. Ohrenh.*, XI., 226.

BÜRKNER.

Ueber die Verwerthung des Leiter'schen Wärmeregulations bei der Behandlung von Ohrenkrankheiten. *Archiv für Ohrenh.*, 18, 3, 1882; *Monatschr. für Ohrenh.*, Berlin, May, 1882.

BURKNER, K.

Bericht ueber die im Jahre 1881, in meiner Poliklinik für Ohrenkranke beobachteten Krankheitsfälle. *Arch. f. Ohrenh.*, Leipz., 1882, XVIII., 297.

Atrophie des schläfenbeines mit multipler Dehiscenzbildung. *Arch. für Ohrenh.*, Leipz., 1882, XVIII., 161.

BURNETT, C. H.

Salicylate of Chinoline in Otorrhœa. *Ann. des Mal. de l'Oreille, du Lar.*, etc., July, 1882.

BURNETT, S. M.

Otomyces Purpureus im menschlichen Ohr. (Trans. by H. Steinbrügge.) *Ztschr. f. Ohrenh.*, Wiesb., 1882, XI., 89.

CAPRON, F. P.

Purulent Middle Ear Catarrh. *Tr. Rhode Island M. Soc.*, Providence, 1882, II.

CHEATHAM, W.

Eye and Ear Clinic; Othematoma or Hæmatoma of the Ear. *Am. Practitioner*, Louisville, Sept., 1882.

CHIMANI, R.

Ueber einige consecutive Erkrankungen der eitrigen Mittelohrentzündung. *Feldarzt*, Wien, 1882, 10.

CHRISTINNECK.

Statistischer Bericht über die in der Poliklinik für Ohrenkranke zu Halle a. S., von 15 October, 1880, bis 15 October, 1881, untersuchten und Behaltenen Fälle. *Arch. f. Ohrenh.*, Leipz., 1882, XVIII., 284.

COZZOLINO.

Dei rumori dell orecchio. *Giorn. di Clin. e Teriapia*, May, 1882.

CURWEN, J. S.

The Tonic Sol-Fa System. *Jour. Soc. Arts*, March 24, 1882.

CZARDA, G.

New Instrument for the Treatment of Diseases of the Nose, Larynx, and Ear. Prag. Illustr. Vierteljahrschr. der ärztl. Polytech., 1881.

Ein anti-septisches Tympanum artificiale. Illust. Monatschr. d. ärztl. Polytech., Bern, 1882, LV., 85.

DUCAU, A.

Un Noyau de Prune ayant Déjourné 33 Ans dans l'Oreille. Rev. Mens. de Laryngol., d'Otol., etc., July, 1882.

DUFOUR, H.

Observations Photophanques. Bull. de la Soc. Vaud. des Sciences Nat. (Abstract) Jour. de Physique, April, 1882.

DUNCANSON, J. J. K.

Report of Cases treated at the General Dispensary, 6 Cambridge Street, Lothian Road, from July, 1880, to end of June, 1881. Edinb. M. J., 1881-82, XXVII., 983.

DUNCANSON, K.

Periscope of Otology. Edin. M. J., June and July, 1882.

EITELBERG, A.

Zur Behandlung der Chronischen Otorrhoe. Wien. Med. Presse, 1882, XXIII., 402, 429.

ELLIOTT, R.

The Milan Congress and the Future of the Education of the Deaf and Dumb. Am. Ann. of the Deaf and Dumb, July, 1882.

ELSBERG, L.

A New Method for Removing Foreign Bodies from the Ear. Detroit Lancet, Sept., 1882.

FALCHI, F.

Contribuzioni Cliniche e Anatomiche alla Tuberculosi Umana dell Occhio.

FARADAY, F. J.

Pronunciation of Deaf-mutes who have been Taught to Speak. Nature, March 16, 1882.

FAUCON, V.

Note sur Deux Cas de Corps Étrangers de l'Oreille. Jour. des Sc. Med. de Lille, May 20, 1882.

FERRERI.

Quelques Signes sur l'Étiologie de l'Hémorrhagie de l'Organe Auditif, et la Description d'une Otorrhagie Hysterique. Lo Sperimentale, May, 1882, Fasc. 5.

FIELD, G. P.

Cases of Removal of Osseous Tumors from the Auditory Canal. Lancet, Lond., 1882, I., 519.

FULLER, A.

The Apportionment of Labor (in Deaf-mute Schools). *Am. Ann. of Deaf and Dumb*, July, 1882.

GELLÉ.

De l'Auscultation Transauriculaire pendant l'Épreuve des Pressions Centripètes. *Trib. Med.*, May 7, 1882.

Otite Suppurées à la Suite du Tamponnement des Fosses Nasales pour l'Épistaxis. *J. de Méd. de Par.*, 1882, I, 443.

GIRARDEAU, C.

Note sur un Cas de Surdit  C r brale (Surdite Psychique) par L sion des Deux Prem res Circonvolutions Temporo-sphenoidales Gauches. *Rev. de Med.*, Paris, 1882, II, 446.

GOLTZ, F.

Hirn-H rschw che. *Archiv f r Physiol. von Pfl ger*, 26 B., 1881; *Monatsschr. f r Ohrenh.*, Berlin, May, 1882.

GOODMAN, L.

A Requisite of a Well Organized Institution (for Deaf-mutes). *Am. Ann. of Deaf and Dumb*, July, 1882.

GRAF, F.

Zur Frage von K nstlichen Trommelfell, besondere von Wattek gelchen. *Ztschr. f. Ohrenh.*, Wiesb., 1882, XI, 128.

On Artificial Drum Membranes, and especially the Cotton Pellet. (Trans. by W. C. Ayres.) *Arch. Otol.*, N. Y., June, 1882.

GREENBERGER, A.

A Beautiful Home (for Instruction of Deaf-mutes). *Am. Ann. of Deaf and Dumb*, July, 1882.

GRINDON, J.

Otitis Media as a Sequel of Small-pox. *St. Louis Cour. Med.*, Aug., 1882.

GRUBER, J.

Ein Fall von Entz ndung der Nasen-Rachen-Mittelohrschleimhaut, bedingt durch anwesenheit eines Kirschkerns in der Nasenh hle. *Monatsschr. f. Ohrenh.*, Berlin, July, 1882.

HAGENBACH, A. W.

Abscess of Mastoid Cells and Py mia; Case. *Chicago M. J. and Exam.*, 1882, XLIV., 275.

HARLAN, G. C.

Some Improved Ear Instruments. *Phila. M. T.*, July 15, 1882.

HARTMANN, E.

Neue akustische Apparate. *Wied. Beiblatter*, No. 3, 1882; *Centralz. f. Opt. und Mech.*, 3, 1882.

HAUSEN, T.

Exostosen i Oeregangen helbredet ved Boring. *Hosp.-Tidende*, March 29, 1882.

HEDINGER.

Die neuere Behandlungsweise der Mittelohr-Eiterungen. *Med. Cor. Bl. d. württemb. ärztl. Ver., Stuttg., 1882, LII., 49.*

HEMENT, F.

Deaf-mutes. *Nature, June 1, 1882.*

HENOCH.

Peripharyngeal Abscess, Durchbruch in der äusseren Gehörgang. *Monatssch. f. Ohrenh., June, 1882.*

HESSLER.

Beitrag zur Physiologie des Ohres. *Arch. f. Ohrenh., Leipz., 1882, XVIII., 227.*

HODGSON, E. A.

The Division of Words into Syllables. *Am. Ann. of Deaf and Dumb, July, 1882.*

HOLT, E.

Acute Inflammation of the Middle Ear. *Ann. des. Mal. de l'Oreille, du Larynx, etc. July, 1882.*

HOTZ, T. C.

Malarial Otitis. *Chicago M. Rev., 1882, V., 252.*

Typical Case of Malarial Inflammation of the Middle Ear. *Chicago M. J. and Exam., May, 1882.*

HURION, A.

Determination des Ventres des Trujaux Sonores a l'Aide des Flammes Manometriques. *Jour. de Phys., March, 1882.*

KALISCHER, S.

Photophar ohne Batterie. *Carl's Repertorium, 1881, p. 563; Abstract in Jour. de Physique, April, 1882.*

KENDIG.

Case of Acute Catarrhal Inflammation of the Middle Ear. *Trans. Lancaster (Pa.) City and County Med. Soc., Jan. and April, 1882.*

KESSEL, J.

Ueber die Function der Ohrmuschel bei den Raumwahrnehmungen. *Arch. f. Ohrenh., XVIII., 3; Monatsschr. f. Ohrenh., Berlin, July, 1882.*

KESSEL.

Ueber das Hören von Tönen und Errauschen. *Arch. für Ohrenh., XVIII., 3.*

Ueber die Verschiedenheit der Intensität eines linearerregten Schalles in verschiedenen Richtungen. *Archiv für Ohrenh., XVIII., 3.*

Du rôle du Pavillon de l'Oreille dans le Mécanisme de l'Audition. *Archiv für Ohrenh., March 15, 1882.*

KIESSELBACH.

Zur Function der halbzirhelförmigen Kanäle. *Arch. für Ohrenh., XVIII., 3.*

KINNE, A. F.

A New Instrument for Removing Foreign Bodies from the Ear. *Detroit Lancet*, June, 1882.

KIRCHNER, W.

Beitrag zu den circulations- und Secretions-Verhältnissen in der Paukenhöhle. *Monatsschr. für Ohrenh.*, Berlin, April, 1882.

KUHN (Strassburg).

Contribution to the Anatomy of the Ear, Part III. The Membranous Labyrinth of Reptiles. *Arch. f. Microscop. Anat.*; *Arch. Otol.*, N. Y., June, 1882.

LADREIT DE LACHARRIÈRE.

Clinique Otologique; des Moyens d'Apprecier la Sensibilité Auditive; Nouvel Audiomètre. *Ann. des Mal. de l'Oreille, du Lar.*, etc., July, 1882.

Le Cathétérisme de la Trompe d'Eustache, Nouvelle Série de Sondes pour le Pratiquer. *Ann. des Mal. de l'Oreille, du Lar.*, etc., May, 1882.

LANDI, B. G.

Nouveau Système de Clavier Chromatique et conséquemment d'une Nouvelle Écriture Musicale. *Les Mondes*, 1882, 1, 131.

LAYARD, E. L.

Function of the Ears in the Perception of Direction. *Nature*, June 22, 1882.

LEDERER, J.

Ueber den Stimmritzenkrampf der Kinder. *Wiener Allgem. Med. Zeit.*, 10 and 11, 1882; *Monatsschr. für Ohrenh.*, Berlin, May, 1882.

LICHTENBERG, K.

Néhány gyarkorlati észrevétel kis gyermekek azon rejtett képü füllobjáról, nelly heveny hurutas állapotok Kozopette szokott fellépni (On the Catarrh of Middle Ear, which frequently appears in Little Children, unnoticed.) *Gyógyászat*, Budapest, 1882, XVII., 97; also *Trans. Pest. Med. Clin. Presse*, Budapest, 1882, XXIII., 169.

LUCAE, A.

Sur l'Hémorrhagie et l'Inflammation Hémorrhagique du Labyrinthe chez l'Enfant. *Virchow's Archiv*, LXXXVIII., 1882; *Ann. des Mal. de l'Oreille, du Larynx*, etc., July, 1882.

MACKENZIE, S.

Menière's Disease. *Brit. M. J.*, Lond., 1882, I., 618.

MCBRIDE, P.

The Causes of Tinnitus Aurium. *M. Times and Gaz.*, Aug. 26, 1882.

MICHAEL, T.

Ueber ein flussiges, künstliches Trommelfell. *Wien. Med. Bl.*, 1882, V., 338.

MOLDENHAUER, W.

Zur Physiologie des Hörorgans Neugeborener. Beiträge zur Geburtshilfe Festschrift, zu Credé's Jubiläum, Leipzig, 1881.

Moos, S.

Doppelthören in Folge einer Iodkaliumkur. Zeitsch. für Ohrenh., XI., 1; Ann. des Mal. de l'Oreille, du Lar., etc., July, 1882.

Zu fälle und Unglücksfälle auf Eizenbahnen, bei welchen eine verminderte Hörschärfe des Locomotivpersonals in Betracht Kommt. Ztschr. für Ohrenh., Wiesb., 1882, XI., 131. (Trans. by W. C. Ayres.) Arch. Otol., N. Y., June, 1882.

Moos, S., and STEINBRÜGGE, H.

Ueber die Bildung eines Neo-membran in der Paukenhöhle als Theilerscheinung der hämorrhagischen Pachymeningitis. Ztschr. f. Ohrenh., XI., II., 1882. (Trans. W. C. Ayres.) Arch. Otol., N. Y., June, 1882.

MOURE, E. J.

Une Perle Enkystée dans l'Oreille Moyenne. Rev. Mens. de Laryngol., d'Otol., etc., June, 1882.

MUNSON, G. S.

A Case of Chronic Suppurative Otitis, with Exostosis of the Auditory Canal, Abscess of the Brain, Death, Autopsy. Med. Ann., Albany, July, 1882.

NANCREDE.

Plaie par Arme à Feu de l'Apophyse Mastoïde ayant atteint le Sinus Latéral, Hemorrhagie Insignifiante. Phila. M. Times, May 6, 1882.

NOBLE, G. H.

Pressure in the External Auditory Meatus; a New Treatment. Atlanta M. Reg., 1881-82, I., 519.

NOQUET.

De l'Ablation des Polypes Muqueux des Fosses Nasales avec le Serre-noeud de Zaufal, à propos de deux Cas ou furent enlevés, dans le premier, 79, dans le second, 58 Polypes ou Morceaux de Polypes. Ann. des Mal. de l'Oreille, du Larynx, etc., July, 1882.

Étude sur la Surdité Amygdalienne. Rev. Mens. de Laryngol., d'Otol., etc., June, 1882.

NOVARO, G. F.

Polipo del Condotto Uditorio Esterno Destro; Estirpazione; Guarigione. Osservatore, Torino, 1882, XVIII., 289.

NYSTROM, J. W.

Intonation of Chime Bells. Jour. Franklin Inst., May, June, 1882.

PENDOLA, T.

Padre Enrico Marchiò (Instructor of Deaf-mutes). Am. Ann. of Deaf and Dumb, July, 1882.

PFAUNDLER.

Apparat zur Darstellung der Figuren von Lissajous. *Cent. Zeit. f. Opt. u. Mech.*, No. 9, 1882.

POLITZER, A.

Primäre bösartige Neubildungen im Gehörorgane. *Wien. Med. Bl.*, 1882, V., 257, 289.

POLLAK, S.

Dry Treatment of Suppurative Otitis. *St. Louis Cour. Med.*, May, 1882.

Necrose und Ansstossung fast des ganzen, grösstentheils unveränderten Knöchernen Gehörapparates; Genesung. (Trans. by H. Steinbrügge.) *Ztschr. f. Ohrenh.*, Wiesb., 1882, XI., 100.

PURVES, W. L.

Physical Diagnosis and Therapeutics in Aural Surgery; Address at the Opening of the Section of Otology of the British Medical Association. *British M. J.*, Aug. 12, 1882.

RAF.

Contribution a l'Etude du Tympan Artificiel, et Surtout sur l'Emploi de Petites Boules de Ouate. *Zeitschr. für Ohrenh.*, XI., II., 1882.

RANKIN, D. N.

Aspergillus in the Human Ear. *Pittsburg M. J.*, 1882, II., 103.

RICHARDSON, F. L. C.

An Interesting Case of Congenital Malformation. (Auditory Apparatus on the Right Side Wanting.) *Lancet*, Lond., 1882, I., 465.

RISLEY (Philadelphia).

A New Arrangement of the Brow-Mirror. *Phila. M. T.*, July 29, 1882.

ROOSA, D. B. ST. J.

Ueber den Werth von Operationen Welche den Trommelfellschnitt erfordern. (Trans. by H. Steinbrügge.) *Zeitschr. für Ohrenh.*, XI., 1, *Monatsschr. für Ohrenh.*, April, 1882.

RÜDINGER.

Ueber das Sprachcentrum im Stirnhirn. *Monatsschr. für Ohrenh.*, Berlin, April, 1882.

SAPOLINI, G.

Come l'Onda Sonora Giunga al Centro Acustico; Studj Anatomico-fisiologici. *Ann. Univ. di Med. e Chir.*, Milano, 1882, CCLIX., 36.

SCHALLE, R.

On Aural and Naso-pharyngeal Diseases and some of their Methods of Treatment, with a Brief Preface by S. Moos. (Trans. by I. Furst.) *Arch. Otol.*, N. Y., June, 1882.

SCHIFFERS, F.

Considérations sur le Pronostic et le Traitement de l'Otorrhée. *Rev. Mens. de Laryngol.*, d'Otol., etc., June, 1882.

SCHRAUTH, C.

Mittheilungen aus dem Münchner Garnisonslazarethe; Bericht über die Abtheilung für Ohrenkranke nebst Bemerkungen über die Wichtigkeit Ohrenerkrankungen in forenser Beziehung. *Aerztl. Int.-Bl.*, München, 1882, XXIX., 174.

Traumatische Trommelfellruptur; Erschütterung des Labyrinthes. *Aerztl. Int.-Bl.*, München, 1882, XXIX., 176.

Acute éitrige Mittelohrentzündung; Pyämie; Heilung. *Aerztl. Int.-Bl.*, München, 1882, XXIX., 176.

Otitis Media Purulenta cum Perforatione; Pneumonie; Pyaemie; Tod. *Ibid.*, 177.

SCHWABACH, E.

The Methods of Testing the Hearing. *Eulenberg's Real-Encyclopädie*, Vol. VI., 567.

Ear Trumpets. *Ibidem*, 574.

SCHWARTZE, H.

Casuistik zur chirurgischen Eröffnung des Warzenfortsatzes, Zweite Serie von 50 Fällen. *Arch. f. Ohrenh.*, Leipz., 1881, XVII., 267; 1882, XVIII., 163.

SEELEY, W. W.

Some General Remarks on Otology. *Cinn. Lancet and Clinic*, July 8, 1882.

SEILER, C.

The Evil Effects of the Nasal Douche. *Phila. M. T.*, Aug. 26, 1882.

SERRA-CARPI, J.

Determination, au Moyen del Microphone, de la Positions des Noeuds et des Ventres dans les Colonnes d'Air Vibrantès. *Comptes Rendus*, XCIV., 4, January 23, 1882.

SEXTON, S.

Occlusion of the External Auditory Meatus. *Lancet*, London, Aug. 12, 1882.

SMITH, E.

Suppurative Catarrh of the Middle Ear. *Trans. Michigan State Med. Soc.*, 1882.

SMITH, H.

Analysis of the Tuning Fork. *Nature*, June 29, 1882.

SMITH, R. M.

Dissection of a Human Otocephalic Cyclops Monstrosity. *Am. J. M. Sc.*, July, 1882.

SMITH, W.

Pyohæmia following Caries of the Temporal Bone. *Dublin Jour. Med.*, July, 1882.

SOJO Y BATTLE.

El Iodoforme en Otologia. *Gac. Med. Catalana*, June 15, 1882.

SOMMERBRODT.

Ueber einseitige porticuslähmung bei einen 1 Jährigen kinde; obduction nach 1½ Jahren. *Breslauer ärztl. Zeitschr.*, 10, 1881; *Monatsschr. für Ohrenh.*, Berlin, May, 1882.

SPENCER (St. Louis).

Vaccinia and Suppurative Otitis. *St. Louis Cour. Med.*, May, 1882.

STANLEY, W. F.

Vibrations of Tuning-forks. Paper read before Physical Society, June 10, 1882. Abstract in *Nature*, June 15, 1882.

Analysis of the Tuning-fork. *Nature*, July 13, 1882.

STEINBRÜGGE, H.

Report of the Progress of Otology during the Second Half of the Year 1881; Comparative Anatomy. *Arch. Otol.*, N. Y., June, 1882.

STEVENS, W. L.

An Organ-pipe Sonometer. *Silliman's Jour.*, June, 1882.

STORRS, R. S.

Articulation in Deaf-mute Instruction. *Am. Ann. of Deaf and Dumb*, July, 1882.

A New Beneficence. *Ibid.*

STROH, A.

On Attraction and Repulsion due to Sonorous Vibrations, and a Comparison of the Phenomena with those of Magnetism. *Jour. Soc. Telegraph Engineers*, XI., No. 42; Abstract in *Nature*, June 8, 1882.

SUÑE Y MOLIST, L.

Osteosarcome et Congestion Méningée. *Gaz. Med. Chir. de Toulouse*, 1882, XIV., 122.

TERRY, J. A.

El Surdo-mudo Argentino; su Instruccion y Educacion. *Memoria Presentada al Congreso Pedagogico de 1882.* *Rev. Med.-Quir.*, Buenos Aires, May 8 and 23, June 8, 1882.

THAULOW.

Obstruction Congenitale, Curable, des Deux Trompes d'Eustache. *Norsk Mag. for Lægevid.*, III., R., XI., Bd. 9; *Arch. f. Ohrenh.*, May 15, 1882; *Rev. Mens. de Laryngol.*, d'Otol., etc., July, 1882.

THOMPSON, S. P.

Koenig's Experiments in Acoustics. *Nature*, June 29, July 20, 1882.

On the Function of Two Ears in the Perception of Space. *Phila. Mag.*, June, 1882.

THORENS.

Observation d'Othematome chez un Enfant Syphilitique. *Union Med.*, Paris, 1882, 3 s., XXXIII., 737.

TROQUART.

Méningite Consécutive à une Otorrhée Ancienne. *Trans. Soc. de Med. et de Chir. de Bordeaux*, May 26, 1882; *Jour. de Med.*, June 11, 1882.

TURNBULL, L.

Hearing in Children. *Boston M. and S. J.*, July 6, 1882.

TYNDALL, J.

Action of Free Molecules or Radiant Heat, and its Conversion thereby into Sound. *Phila. Mag.*, June, 1882, and supp. number, June, 1882.

URBANTSCHITSCH, V.

Ueber subjective Schwankungen in der Intensität und Acoustischer Empfindungen. *Wien. Med. Presse*, 80, 4, 82; *Monatsschr. für Ohrenh.*, Berlin, May, 1882.

Natasa de las Enfermedades del Oído. (Trans. by C. Sanchiz and C. de Vicente.) *Madrid*.

VAUTIER, T.

Sur un Mouvement Vibratoire à la Naissance d'un Jet de Vapeur. *Comptes Rendus*, XCIV., 10, March 6, 1882; Abstract in *Philosophical Mag.*, April, 1882.

VICARÒ, G. R.

Analysis of the Tuning-fork. *Nature*, July 20, 1882.

WEBER, R.

Darstellung longitudinaler und transversaler Wellen durch Projection. *Med. Ann.*, 1882, 3.

Die Telephonie des für fünfzehnten Jahrhundert. *Wied. Bei-Bl.*, 3, 1882; *Centralz. f. Optik und Mech.*, 2, 11, 1882.

WEBER-LIEL.

Apparat zum ausspülen von eitrigen, eingedichten oder cholesteatomartigen Massen aus schwer zugänglichen, sinuösen, cariösen Parthien des Mittelohres und äusseren Gehörganges. *Monatsschr. f. Ohrenh.*, Berlin, July, 1882.

Tinctur a Thujæ occ. *Monatsschr. f. Ohrenh.*, Berlin, July, 1882.

Notizen zur Frage über die Entstehung des Gehörschwindels. *Monatsschr. f. Ohrenh.*, June, 1882.

WHITE, H.

Teaching Idiomatic Language. *Am. Ann. Deaf and Dumb*, July, 1882.

WILSON, F. M.

Acute Suppuration of the Middle Ear. *N. Eng. M. Monthly*, 15th Aug., 1882.

Notes.

LEHRBUCH DER OHRENHEILKUNDE FÜR PRACTISCHE AERZTE UND STUDIRENDE. VON DR. ADAM POLITZER.

The second volume of Dr. Adam Politzer's work on "Diseases of the Ear" has been received at such a late date that the complete review which it merits will be reserved for the January number of this JOURNAL. This second volume contains about the same number of pages as the first. Its first chapter treats of otitis media chronica sicca, or what is sometimes called proliferous inflammation of the middle ear. Otitis media purulenta chronica is very fully described in the next chapter, and, together with its complications, such as granulations, polypi, caries, and necrosis of the temporal bone, facial paralysis, meningitis, cerebral abscess, phlebitis and thrombosis, hæmorrhage from the internal carotid artery, and mastoid disease, covers about half of the entire volume.

The second part of the volume begins with a description of the diseases of the outer ear, including the pinna and external auditory canal; the subject of foreign bodies is also included in this chapter. The following chapter is devoted to a consideration of diseases of the internal ear, the anatomy of this portion of the ear being first fully given together with the physiology. The last chapters are devoted to a short account of deaf-mutism and instruments for aiding hearing. The wood-cuts are particularly well done, and give the reader a very clear idea of the morbid appearances of the drum-head and the different portions of the ear.

With even the brief reading which preceded this note, it is impossible not to be struck with the thoroughness and completeness of the author's work, and the volume is certainly a great addition to otological literature.

ORAL SURGERY. — At the annual meeting of the Board of Overseers of Harvard College, held September 13th, Joseph Weatherhead Warren was appointed instructor in oral pathology and anatomy in the medical school. This action may be taken as a recognition of the want of instruction which is known to exist in an important department of medicine. It is to be hoped that, hereafter, some knowledge in this branch may be requisite when the candidate comes up for his degree. Indeed, it is very desirable that the affections to which the mouth is subject, both major and minor, should be treated by those who are possessed of a knowledge of general as well as of special (oral) medicine, inasmuch as these dis-

eases are not of local interest merely, but very much concern the general practitioner at times. And the intimate nervous relationship, moreover, which is often the occasion of reflected morbid action in neighboring parts, when dental irritation exists, gives the subject special interest to those who treat affections of the ear, nose, throat, and eye. Medical literature during the past few years plainly shows that there is an increasing interest in this subject.

CORRECTION.—In justice to Dr. Löwenberg, the reviewer of his paper on "Furunculosis of the Ear" desires to make the following correction. On page 143 of this JOURNAL it is said: "There are some points, however, where the author does not appear very clear, or contradicts himself. On page 12 it is stated that instillation of glycerine offers an obstacle to the development of the micrococci, without, however, stopping entirely their development. This action of glycerine is based upon its hygroscopicity, which causes a profuse exosmosis from the *skin*; that is, deprives it of water, which is the most favorable medium for their development. On page 27, in speaking of the relation between diabetes mellitus and furunculosis, he states that the poor conditions of general vitality favor a smaller degree of resistance to the development of the micrococci, and that sugar, not being consumed, remains in the blood, while the excessive combustion of albuminates causes agotæmia. These two causes, he says, produce an abnormal concentration of the blood, which draws moisture from the surrounding tissues and also from the skin, which becomes dry, and thus favors the development of the germs. Withdrawal of water through glycerine acts against this development; withdrawal of water through the greater degree of concentration of the blood favors it. This is decidedly a contradiction."

By referring to page 12 of the original article, it will be seen that Löwenberg does not speak of the action of glycerine as causing exosmosis from the *skin*, but he says that through its hygroscopicity it withdraws water from the *microbes* themselves (*à leur dépens*), and in this way offers an obstacle to their development, without, however, stopping it entirely. Hence the contradiction of which the reviewer accused him does not exist, and the reviewer is happy to state so.

J. J. B. V.

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